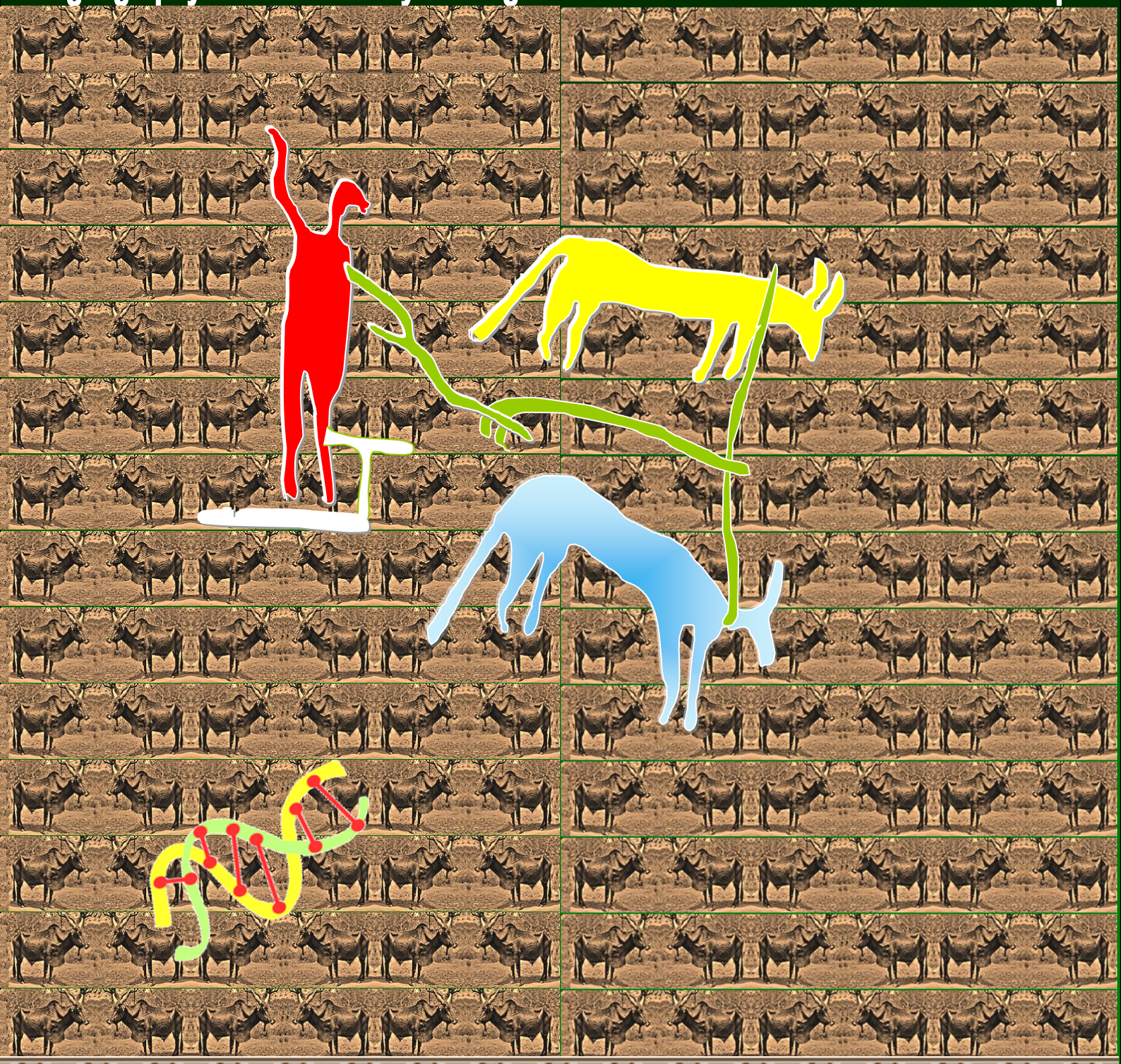
ATLAS

Biogeography and Biodiversity of Indigenous Domestic & Wild Mammals of Ethiopia



Melaku Tefera

ATLAS

Biogeography and Biodiversity of Indigenous Domestic and Wild Mammals of Ethiopia

Melaku Tefera

Professor

Department of Biomedical Sciences
College of Veterinary Medicine

Haramaya University

Haramaya University, P.O.Box 138 , Dire-Dawa, Ethiopia
2013

Citation of this publication:

Tefera M. 2013. Atlas of indigenous domestic and wild mammals of Ethiopia. Haramaya University Press, Ethiopia. 68p. ISBN 978-99944-981-3-0

Library Catalog
Atlas, biodiversity, breeds, endemic, Ethiopia, extinct, livestock, mammals, pet animals, wildlife

About the Author
Melaku Tefera is a professor at Haramaya University. Graduated in 1985 with DVM from Addis Ababa University. Further studied at Ecole National Vétérinaire d'Alfort and UNCEIA, Paris France. Université de Rennes, France. NIAH Japan. Agricultural University of Norway (UMB) and Norwegian School of Veterinary Science (NVH). Worked at Addis Ababa University, Mekelle University, Wollo University , Jigjiga University and Science World, Vancouver BC, Canada. Currently he is Head of Department of Biomedical Sciences at Lilongwe University of Agriculture and Natural Resources, Malawi.

Atlas preparation:
This Atlas was designed and produced by
Melaku Tefera,
College of veterinary medicine, Haramaya University. P.O.Box, 1641, Ethiopia.
Tel. 0914722459,
<melaku22@yahoo.com>
(URL) http://www.academia.edu/melakutefera

First edition 2013

Published by :
Haramaya University Research and Extension Office
P.O.Box 138
Dire-Dawa
Ethiopia
www.haramaya.university.edu.et

Printed by:

Apple Printing Press, Addis Ababa

Foreword

Ethiopia is very rich in animal and plant genetic resources. The Russian botanist Nicolay Ivanovich Vavilov classified Ethiopia as center of the genetic diversity of plants. Ethiopia has contributed to the world's food crops like coffee, teff, cotton, barley, enset, and sorghum. Haramaya University located in the center of biodiversity, is also a center of excellence for such research. So far in the major research undertaken, the balance inclines towards botanical documentation .

Zoogeographers divided the world into five faunal regions, the richest region is known as the Ethiopian Region. Hitherto little has been done to catalogue animals in Ethiopia.

This Atlas is the first of such an endeavor. It is environmentally friendly , can serve as a teaching material, creates awareness to conservationists, serves as a baseline for researchers, shows the importance of indigenous knowledge, and the contribution of Ethiopia to the world in terms of animal genetic resources. The Atlas gives direction in the perspective of issues of *in situ* conservation and animal breeding policy.

I anticipate great use will be made of this Atlas, as much as the information is original. I commend the author for producing this concise highly elaborate and vivid description of the animal resource's of Ethiopia.

Nigussie Decahssa (Professor)
Vice President for Research and Extension Affaires
Haramaya University
August 2013

Preface

Ethiopia is among the world leaders in terms of plant and animal biodiversity and endemism. This Atlas is a compendium designed to give an overview of Ethiopian domestic and wild mammals. Some of the sections are original that there was no studies undertaken before, like that of the donkey, camel, dog, horse and cat.

In the advent of global change many of these breeds and species are on the verge of extinction, among these the majestic black mane lions, *Panthera leo abyssinicum* to see their image only in this Atlas.

Until now very few studies were done on the breeds and species characterization such that, diversity, productivity, adaptation to environment, disease resistance, nutritional and reproductive physiology. This Atlas would be inspirational for the young to study these aspects using advanced techniques.

The writing of this atlas is a solo initiative, knowing that this atlas will be of significance for various individual researchers, institutions and universities. As a result any mistake, omission or exaggerations in this atlas are my responsibility.

Acknowledgements

I wish to thank every one who helped me to write this Atlas . I am greatly indebted to Haramaya University Research and Extension office for the unparalleled support, otherwise the printing of this atlas would have been impossible. I thank also The Donkey Sanctuary particularly Dr. Bojia Endebu for the immense support provided, the chapter on donkey breeds.

I would like to thank my wife Nigisti and my daughters Winta and Saba who has been so patient and understanding my absence, during writing this Atlas.

Whilst every effort has been made to trace the owners of copyrighted material. In a few cases this has proved impossible and I take this opportunity to offer my apologies to any copyright holder whose rights I may have unwittingly infringed.

"May this please the people"
(King of Kings Ezana 330-356 AD)

Camel and its calf drinking water from shallow hand dug well in river bed Berahle, Danakil Afar

CONTENTS

CAHPTER 1: INTRODUCTION /BIOCULTURAL-DIVERSITY

Ethiopia has long been recognized as a source of genetic diversity in plants and animals and served as a gateway of animal genetic resource (AGR) from Asia to Africa and that its diverse ecology served to further diversify and develop the genotypes it received (Phillipson, 1993; Payne, 1990). Indigenous livestock have developed characteristics, which make them well adapted to their environment under which they live and produce. Generally they are well adapted to harsh conditions: have a high degree of heat tolerance, partly resistant to many of the diseases prevailing in the tropics and have ability to survive long periods of feed and water shortage (FAO, 1987). These properties are acquired by natural selection over hundreds of generations. Thus, indigenous breeds form a valuable genetic resource, which needs to be maintained and improved as the basis for natural livestock breeding programs and policies. However, inadequate attention was given to evaluate these resource or to setting up realistic and optimum breeding goals for their improvement.

High population growth rate and the desire for higher living standard is putting pressure on livestock owners to increase production. This has resulted in policy to use narrow range exotic genotypes such as Holstein Friesian cattle, Anglo Nubian goats, Dorper sheep, White leghorn chicks; that thrive in high input production system. Interbreeding among indigenous breeds as a result of increased intermingling through trade and social exchange, effects of protracted border wars, worsened by drought , a shift from livestock to a dead stock as a result of mechanization of farms and transportation are creating additional pressure on the erosion of AGR. As a result AGR in Ethiopia is endangered unless urgent concerted efforts are taken to conserve them. Ethiopia has the largest livestock population in Africa as well as the number of breeds (FAO 2000; Mason,1996). Breed or species conservation requires characterization; hitherto there has been very little attempt to characterize and catalog the livestock of Ethiopia.

Relative genetic diversity can be determined using phenotypic characteristics and/or molecular markers. Phenotypic characteristics of livestock breeds as well as their adaptive characteristics are important in identifying breed attributes for immediate use by farming communities.

Ethiopia is one of the world's rich biodiversity countries and it deserves attention regionally and globally (Morgan, 1973; Yalden and Largen, 1992). Wildlife population in Ethiopia has diminished over the past century both in amount and distribution.

The tapestry of life on Earth is unraveling as humans increasingly dominate and transform natural ecosystems. Uneven distribution of species, threats, scarce resources and dwindling time; force conservationists, to target their actions to specific area of high priority.

Unfortunately, the ability to focus strategically is hindered by the absence of a global biodiversity map with sufficient biogeographic resolution to accurately reflect the complex distribution of the Earth's natural communities.

Table 1.1 Livestock population and breeds in Ethiopia and Africa

Species	Population x 10^{3*}			Number of breeds**		
	Ethiopia	Africa	As % of Africa	Ethiopia	Africa	As % of Africa
Cattle	30,000	192,000	15	17	200	9
Goat	17,000	170,000	10	14	61	22
Sheep	23,000	202,000	11	11	135	8
Camel	1,000	14,000	7	5	36	14
Donkey	4,000	11,000	36	2	15	13
Horse	1,500	3,000	50	2	34	5

(*Pane, WJA. 1997. * * Mason, 1996)

Without such a map, many distinctive biota remain unrecognized.

In a major animal biodiversity conservation, the primary activity is cataloging of animals species, usually the first taxa to be listed are large mammals hence the main focus of this atlas too.

Methodology

A field and literature survey was conducted to determine the breeds , status and geographic distribution of large domestic and wild mammals of Ethiopia.

Although there are several definitions of breed, we have adapted the combined definitions of FAO, (2000) and Köhler-Rollefson (1990).A breed is homogenous sub specific group of domestic livestock with definable and identifiable external characteristics that enable it to be separated by visual appraisal from other similarly defined groups within the same species or a homologous group fulfilling the criteria of (i) being subjected to common utilization pattern, (ii) sharing a common habitat/ distribution area, (iii) representing largely a closed gene pool, and (iv) being regarded as distinct by their breeders.

Strains means a sub-division of a breed within the same population. Differentiating characteristics include same traits but minor variation in ear, horn and tail types and size, coat color, hair length within the same population.

Variety are breeds in different populations possessing some common traits with other populations.

Most of the study in this Atlas employed Marco level studies similar to a survey methodology developed by IEMVT/CIRAD (ILCA, 1992) . The study was based on stratified sampling procedure information about herds and animals were collected by asking basic information about the animal and taking some measurements and photos of representative animals .

Physical characteristics including coat color details of special colors and color combination. Measures of adult size and weight including withers height, live weight, body length (for each sex) standard deviation or range of values were calculated.

Qualitative description of predominant management system (stationary, transhumant, nomadic, housing, feeding etc).

Current uses (purposes) as indicated by producers and ranked by priority. Possession of special or unique adaptive traits such as resistance to major diseases and to climate, biological performance, important traits applicable to dairy, meat or dual-purpose breeds, and indication of variation, were recorded.

Literature both published and unpublished were also used. For wild animals status determination Data base of IUCN (2010) was used.

Previous studies by the author are the primary reference for compiling this material which are the following:

Tefera, M. 2004. Recent evidence of animal exploitation in the Axumite époque , 1st – 5th century AD. Tropical Animal Health and Production.36, 105-116

Tefera, M and D'Andrea, C.2006. Analysis of zoomorphic painting in seven rock shelters in Northern Ethiopia. In: 18th biennial conference, society of African-ist archeologist (SAFA) 23-26 June 2006. University of Calgary, Alberta, Canada.

Tefera, M. and Gebreab, F. 2001. A study on the productivity and diseases of camels in eastern Ethiopia. 2001. Tropical Animal Health and Production. 33: 265-274

Tefera, M. 2000. Reproductive performance of donkeys in Ethiopia. J. Eth. Vet. Asso. 4: 23-29

Tefera, M. 2003. Phenotypic and Reproductive characteristics of lions (Panthera leo abyssinicum) at the Addis Ababa zoo. Journal of Biodiversity and Conservation. 12:1629-1639.

Tefera, M.2002. Phenotypic and reproductive characteristics of donkeys in Ethiopia .Fourth international colloquium on working Equines Eds: Anne Pearson, Denis Fielding and Darem Tabba. Hamma, Syria.322-326

Tefera, M. 2011. Wildlife in Ethiopia: Endemic large mammals. World Journal of Zoology. 6(2):108-116

Tefera, M. 2011. Oxenization versus tracterization: Options and constraints for Ethiopian farming systems. Int. J. sustainable. Agriculture. 3(1):11-20

Tefera, M. 2011. Endemic Large Herbivore of Ethiopia. Ethiopian Veterinary Bulletin. 3:20-24

Tadesse G., Gebreab F., Tefera , M . 2013. Reproductive Characteristics of Abyssinian Jennies Exposed to Stallions and Jackasses. Ethiop. Vet. J. 17:77-84

Plate 1. 1 A flock of Black Head Ogaden sheep near Dire-Dawa

Origin

Zoogeographers divided the earth into different zoogeographical regions. A geographic unit of faunal homogeneity. Ethiopian region is one among them. This region is also considered as center/sub center of domestication.

A multiple pathway to early food production occurred in Ethiopia. 1) The Plough and cereal complex 2)Pastoral complex 3)Hoe and cereal complex 4) hoe vegeculture 5) mixed farming, hunting and fishing .Animal production appears clearly visible in the archaeological record in both East and West Africa between 4 500 and 4 000 years ago (Phillipson, 1993).

The origin of indigenous livestock in Ethiopia is not very well known due to insufficient zoological, archaeological, anthropological and historical studies carried in the country (Tefera, 2004). A number of theories have been advanced as to the time and routes by which domestic animals were introduced in to Ethiopia. They could have been introduced from the Nile valley, the Red sea littoral , across the Red Sea from Arabia or by all these routes at different times (Payne, 1990) , as shown on Figure 1.

Origin and date introduced of different livestock in Ethiopia is shown on Table 1.2

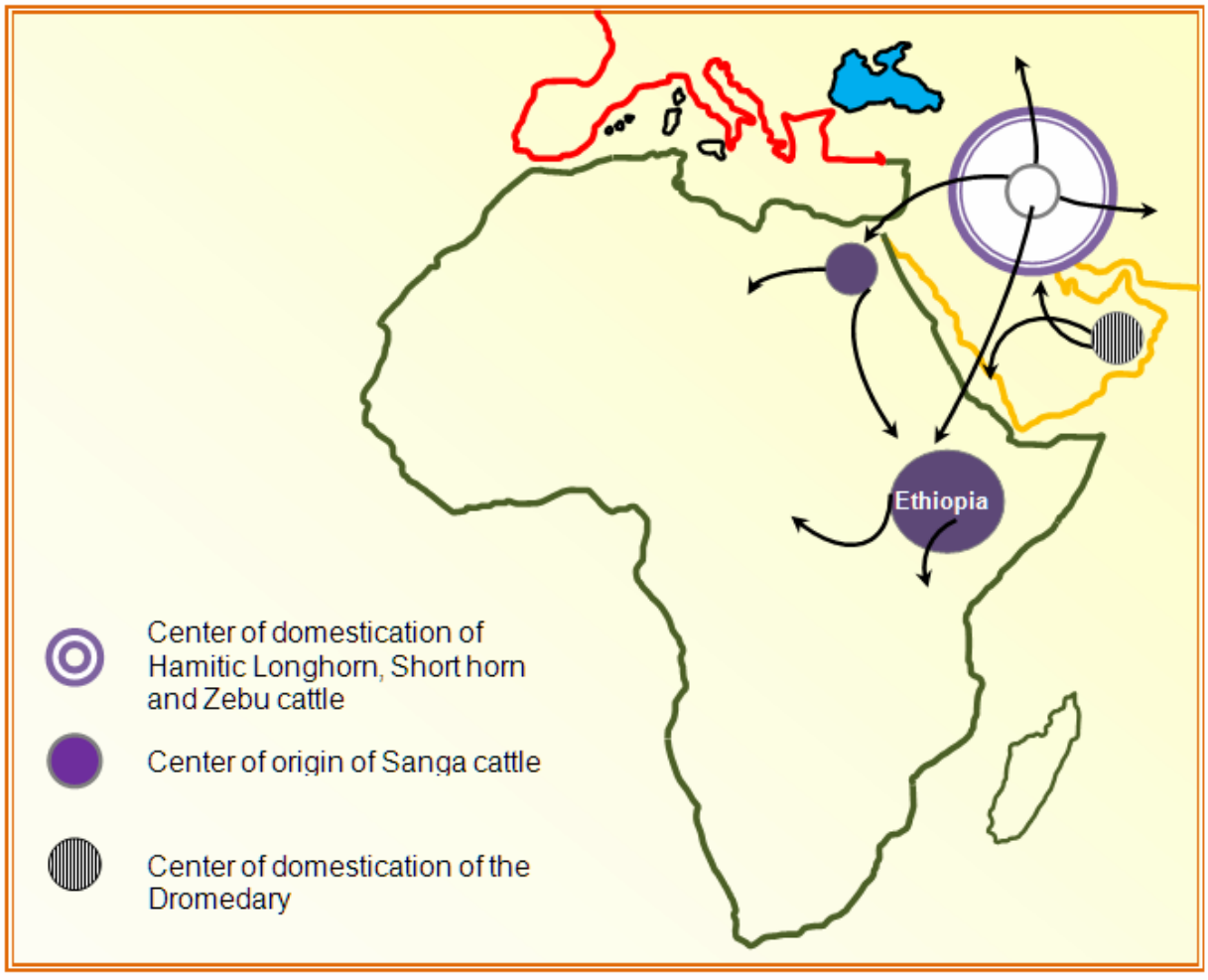


Figure 1. 1 Centers of domestication and origin and possible routes by which cattle, goat, sheep, camel and horses entered Ethiopia.

TABLE 1. 2 Probable origin and dates of introduction of livestock in Ethiopia1

Species	Ancestor	Place domesti-cation	Date domes-tication	introduced in Africa	introduced in Ethiopia
Cattle	*Bos Primigenius*	South west Asia	8000 BP	7000 BP	5000 BP
Hamitic long horn	*B.p. taurus*	South West Asia	7000 BP	4500 BP	3000 BP
Hump less short horn (Brachceros)	*B.p. taurus*	South West Asia	5000 BP	3500 BP	2500 BP
Zebu	*B.p indicus*	South West Asia	600 BP	600 BP	600 BP
Sanga	*(Bos Taurus x Bos indicus)*	Africa	2500BP		
Zenga	(Zebu x Sanga)	Africa			
Goats	*Capra aegagrus*	South West Asia	10000 BP	7000 BP	5000BP
Sheep	*Ovis orientalis*	South West Asia	10000 BP	7000 BP	5000BP
Camel (Dromedary)	*Camelus bactria-nus*	South West Asia	5000	2000 BP	1500 BP
Donkey	*Equs a, africanus Equs a. somalicus*	Nile valley (Ethiopia)	3500 BP (Ethiopia)	3500BP	3500BP
Horse	*Equs prezvalski*	Eurasia	5000BP	3000BP	1000 BP
Dog	*Canis lupus*)	Eurasia	15,000BP		
Cat	*Felis silvestris*	Near East	10,000BP		

(Compiled from: Epstein, 1971; Albero and Hailemariam, 1982; Maule, 1990, Tefera, 2001, Ostrander and Wayne, 2005; Adamelli et al. 2005). The horse is not mentioned in Axumite archaeology nor in any of the cave paintings. The only available report is post Axumite 13th centaury (Punkhurst, 1989) . Swine are not indigenous, they were introduced by colonial Italians in 1900.

Plate 1. 2 The time honored Ethiopian plough almost 3000 years old (Goe, 1987), depicted also in cave painting at Amba Fekada (See Plate 1.4 C, and front cover of this atlas).

Neolitization in Ethiopia is linked to the spread of agropastoral economy (Pankhurst, 2004). And this is marked in various rock art and archaeological evidence (Tefera, 2004).

Bas -relief inscription first historical illustrations of life In Sub-Saharan Africa shows the native puntities in procession of domestic animals, including dogs, donkeys and Short and long horned hump less cattle. Hump less longhorn cattle attended by herders carrying spears dominates in the Ethiopian rock art. While the majority of cattle depicted in south Arabian art works are short horned, it is suggested that the longhorn cattle in Ethiopian rock art are earlier than the influence from south Arabia. New genetic data support archaeological hypotheses of early Holocene domestication of cattle in North Eastern Africa (Phillipson, 1993).

During the Axumite era (1st millennium AD), museum artifacts and ecofacts (plate 1.4) evidence the depiction of wild and domestic animals. A shift from hunting of large game animals, such as elephants, to the use of domestic cattle and the plough is evident. Although it is difficult to reconstruct an all subsistence pattern, considerable investment in non-portable storage features argues that the population practiced combined activity of plant cultivation and animal herding was largely sedentary and agrarian.

Axumite inscriptions name domestic animals; cows and sheep were mentioned in inscriptions from Safra (a pre-Axumite sanctuary). They also attest to the use of cowhides and horns (Littmann, 1913, cited by Joseph 1979). A clay figurine of a pair of bulls under yoke, and figures of humped and non-humped cattle were discovered by Phillipson (1995), symbolizing the use of plough during those days. Engraved images of a pair of bulls harnessed to plough is found in a pre-Axumite sanctuary at Amba Fekada near Gulomekeda. This plough does not differ from modern Ethiopian ones it consists of five parts without mould boards.

Plate 1.3 The livestock and human bond , Southern Ethiopia

Plate 1.4 Cave painting of a cow with prominent udder at Amba -Fekada I (A) , painting of ovicaprin at Amba-Fekada II (B) , a hunting and plough scene at Amba Fekada II (C) , bas relief carving of hump less short horn cattle in Southern Ethiopia (D) figure of a lioness cut on a rock at Gobo-Dura Axum (E) hump less long horn cattle and camel at Lege-Oda (F) Statuette of yoked bulls(G) and clay figurine of head of bulls(H).

These artifacts and ecofacts show evidence of depiction of wild and domestic animals. A hunting of large game animals, such as lions , to the use of domestic cattle and the plough is evident. Although it is difficult to reconstruct an all subsistence pattern from the archeology, considerable investment in non-portable storage features argues that the population practiced combined activity of plant cultivation and animal herding and was largely sedentary and agrarian. The date of ecofacts, artifacts and paintings range from first millennium BC to first millennium AD (Tefera, 2001).

The ecosystem

This section is presented here following the scheme of A.R. Wallace, biogeography proceeds along two lines. Geographical biology studies space related properties of plants and animals and regularities of distribution or spatial distribution in ecosystem as geoelements.

Ethiopia has a total land area of 122 million hectares, with a varied topography from 116m below sea level at the Afar triangle to 4533m above sea level at mount Ras Dashen, and it is broadly dichotomous classified in to highland and lowland. The periphery encircling the country consist generally lowland plains, elevation below 1500 m and mean annual rainfall below 500mm. The lowland makes 65 million hectare (61%) of the total area, consists mainly pasture land home to 12% of the population and 26% of the livestock (Coppock, 1994). The climate in the lowlands is arid and, owing to the unreliable rainfall, the ecosystem in these environments never achieves equilibrium between grazing and fixed number of settled livestock. And with increasing drought and erratic rainfall, cultivation of land is difficult and crop failure is common resulting in reduced per capita food production. Thus, traditional pastoralism constitutes the only efficient means of exploitation the dryland resources (Payne 1990; Wilson 1984) otherwise heavy investment or irrigation and moisture harvesting technologies would be required.

The lowlanders are linked to the highlanders socially and economically via what is called the string of nature: water is discharged in the form of rain on the mountain roofs of Ethiopia and agriculturalist plough and cultivate cereals. While the streams run to the lowland peripheral plains forming several perennial rivers which are the last refuge of pastoral people during the driest periods.

The central highland where there is annual rainfall between 500mm to 1000 mm is suitable for crop cultivation, it comprises 18 million hectare, and it is inhabited by subsistence smallholder mixed crop livestock farmers. Further more based on moisture and temperature relations Ethiopia is divided in to 18 Agroecological zones. These Zones vary markedly in terms of Altitude, rainfall, temperature number of plant growing days per year, forage production, common plant association, human and livestock carrying capacities.

Plate 1.5 Panorama of the blue Nile falls Bahirdar

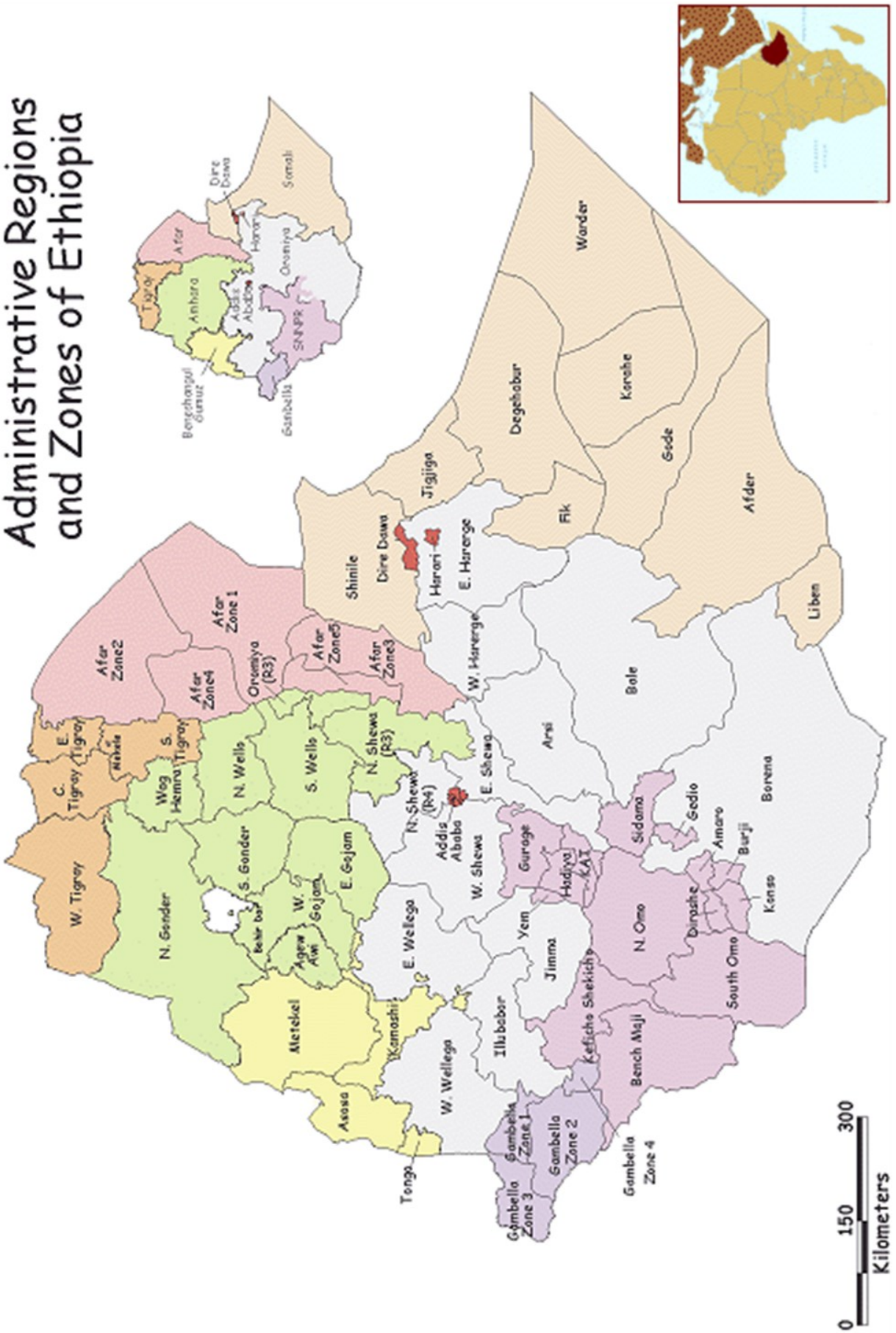


Figure 1.2 Administrative regions of Ethiopia

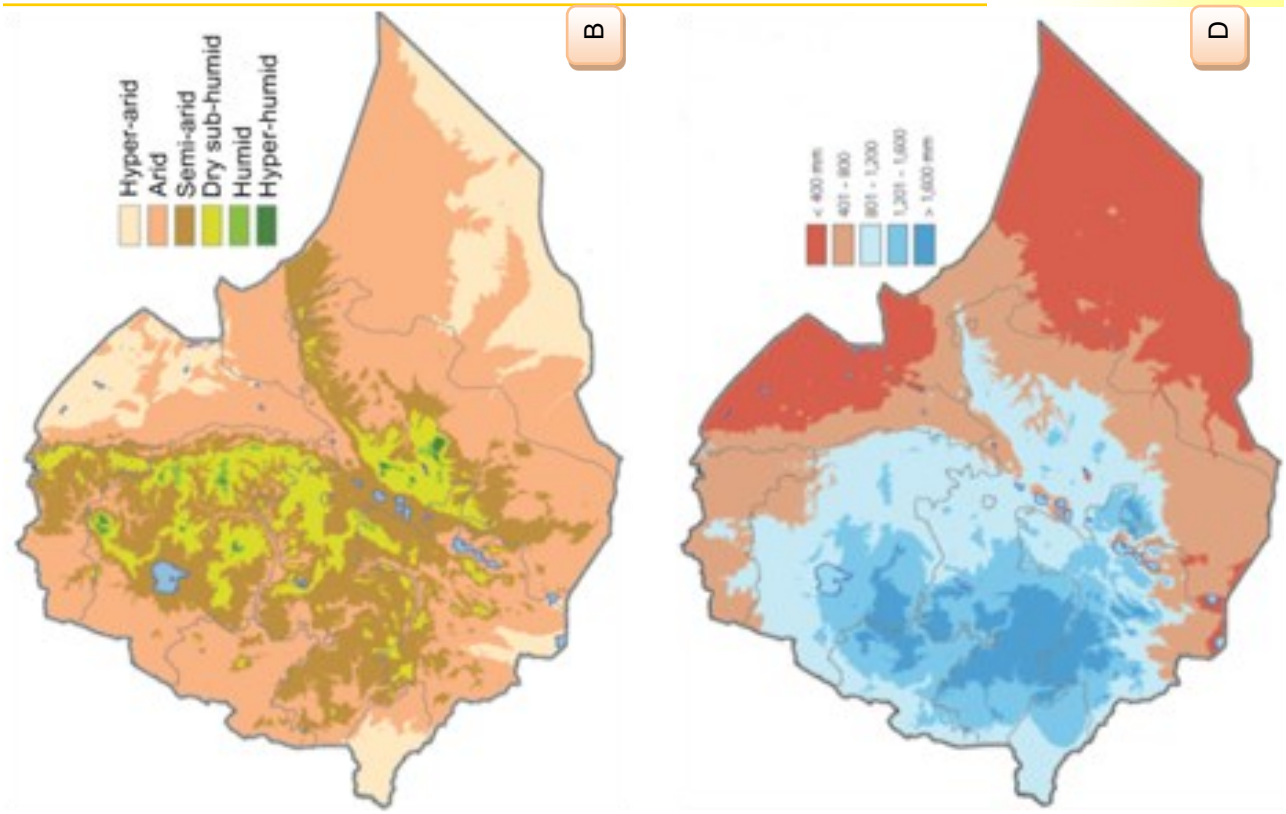
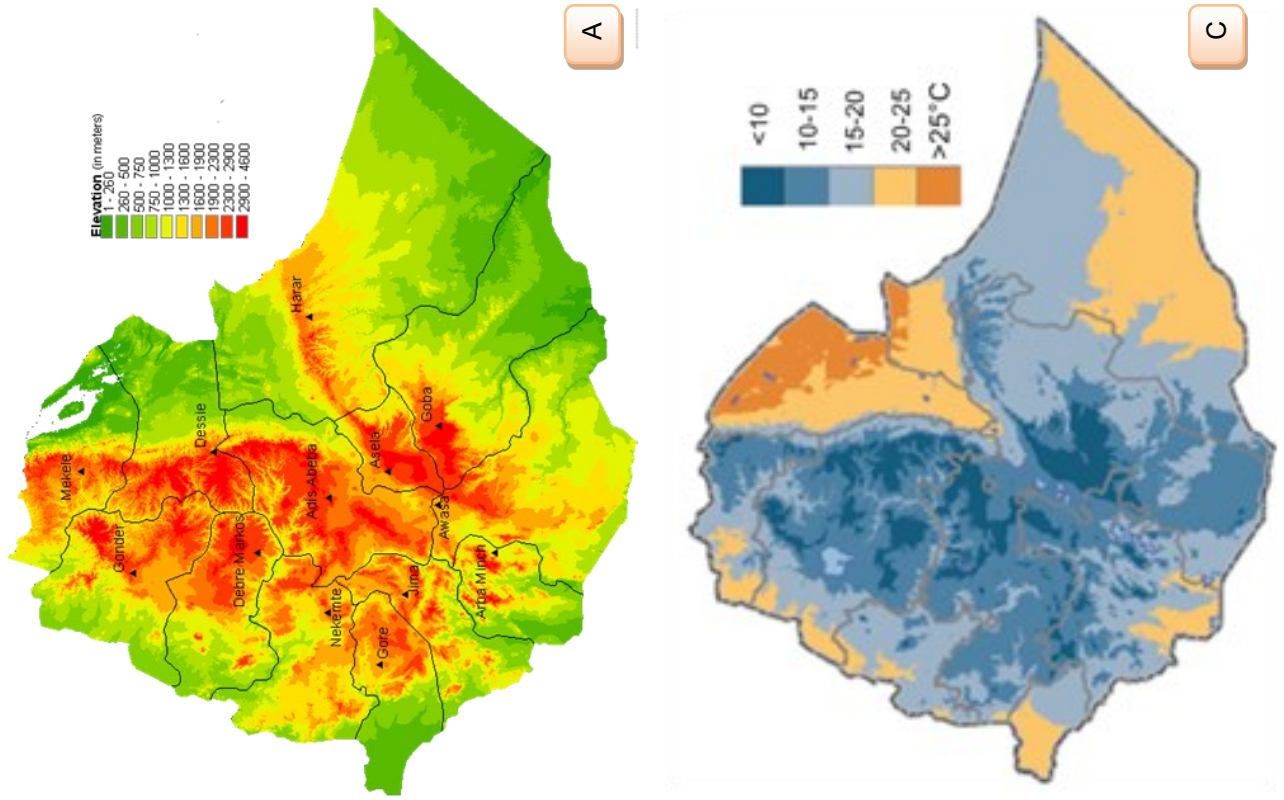


Figure 1. 3 maps showing altitudinal zonation (A) , rainfall (D) , temperature(C) and growing period (B).



CHAPTE 2: CATTLE BREEDS

Cattle evolved around 10,000 years ago from *Bos primigenius* known as aurochs which had three subspecies: *Bos primigenius primigenius* from Europe and the Middle East; *B. p. namadicus* from India; and *B. p. mauretanicus* from North Africa. Only the nominate subspecies has survived until recent times. Modern cattle are classified as *Bos primigenius taurus* and *indicus*. The origin of indigenous cattle of Ethiopia is not very well known due to insufficient archeological and genetic studies (Rege, 1999).

Hamitic longhorn, shorthorn and zebu cattle were introduced in to Africa by immigrants from western Asia (Payne, 1964). Hamitic longhorn cattle were the first to be introduced in to Africa 5000 BC . While humpless shorthorn cattle were introduced around 2500 BC (Albero and Hailemariam, 1982; Epstein, 1984). However the origin of Sanga cattle is unknown.

In our contemporary, there are three cattle production systems in Ethiopia: a draught oriented system in the highlands, a milk oriented system in the lowlands (subsistence) and a minor commercial dairy system in periurban areas (exotic cattle). However, farming systems are not static. They change overtime and between locations owing to changes in resource availability and demand patterns.

Pastoral production system:

Ethiopia is a country, which is frequently affected by drought and erratic nature of the rainfall, hence a national carrying capacity cannot be predicted precisely that is, there is no equilibrium between pasture and fixed number of livestock. Ethiopian highlands have 70% of cattle population while the lowlands have 30%. Traditionally the highlands and lowlands are linked economically in the form of trade. The highlands supply the cereal requirement of the pastoralists. In return the pastoralist supply livestock to the sedentary farmers, which they use them as plough oxen, see Figure 2. 1.

In all pastoral systems the consumption of milk or blood seems to be steadily dropping, and there are few, if any which rely almost totally on milk or milk products. In some the reliance is still fairly high. The Borana of the southern rangelands of Ethiopia for example, with some seasonal variations, still consume up to 59% of their diet as milk or milk products with the balance of the diet being increasingly made up of grain.

Sedentary agriculture:

In Ethiopia annually 10 million hectare is cultivated using oxen power. Thus cattle are mainly kept for ploughing and not for milk or meat most farmers around 60% do not own or have only one ox. Cows are not ploughed because under scarce nutrition in addition to a work they will completely stop reproducing and hence no subsistence milk production. These farmers they occupy the central highlands. Mainly they relay on rain fed agriculture.

Both pastoralists and sedentary farmers rarely sell or kill animal for meat unless conditions compel them like cultural commitment. Farming was purely subsistence production.

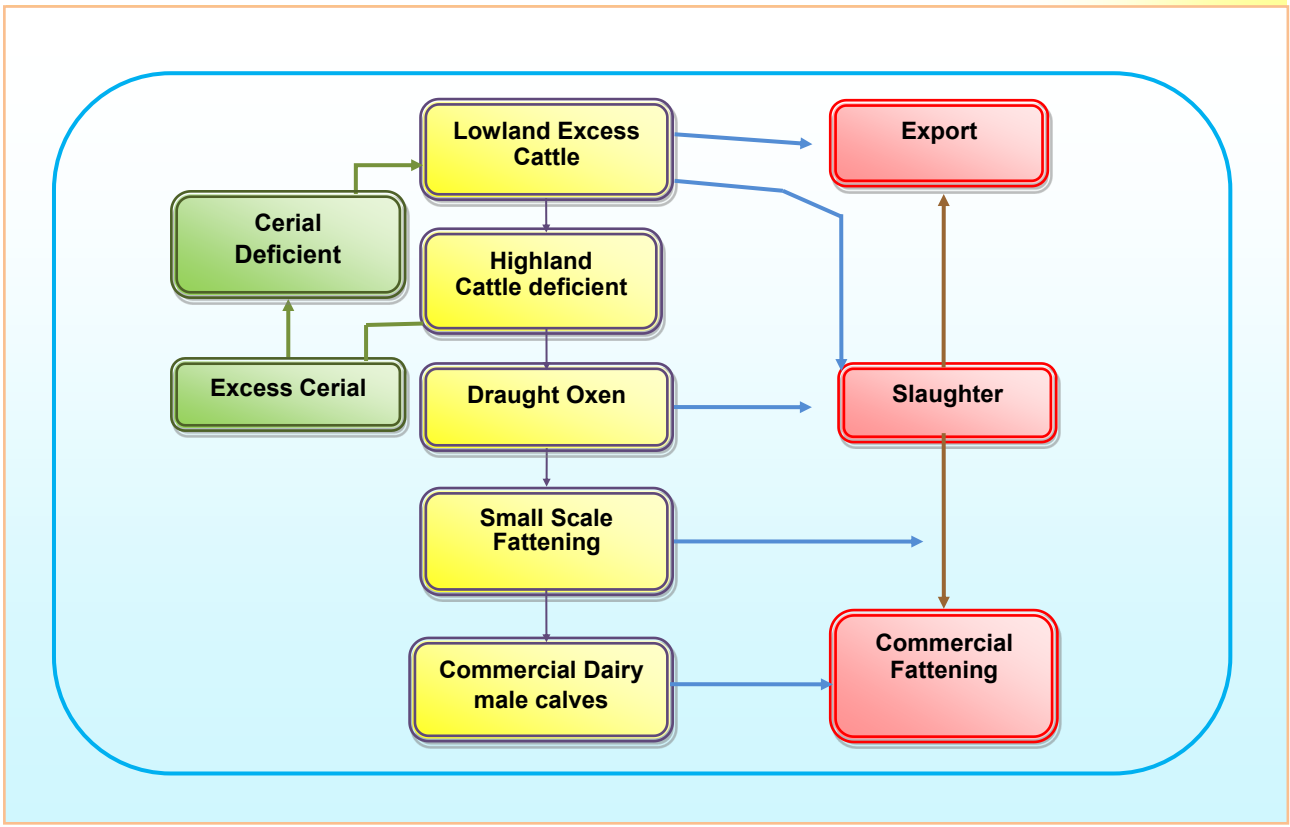


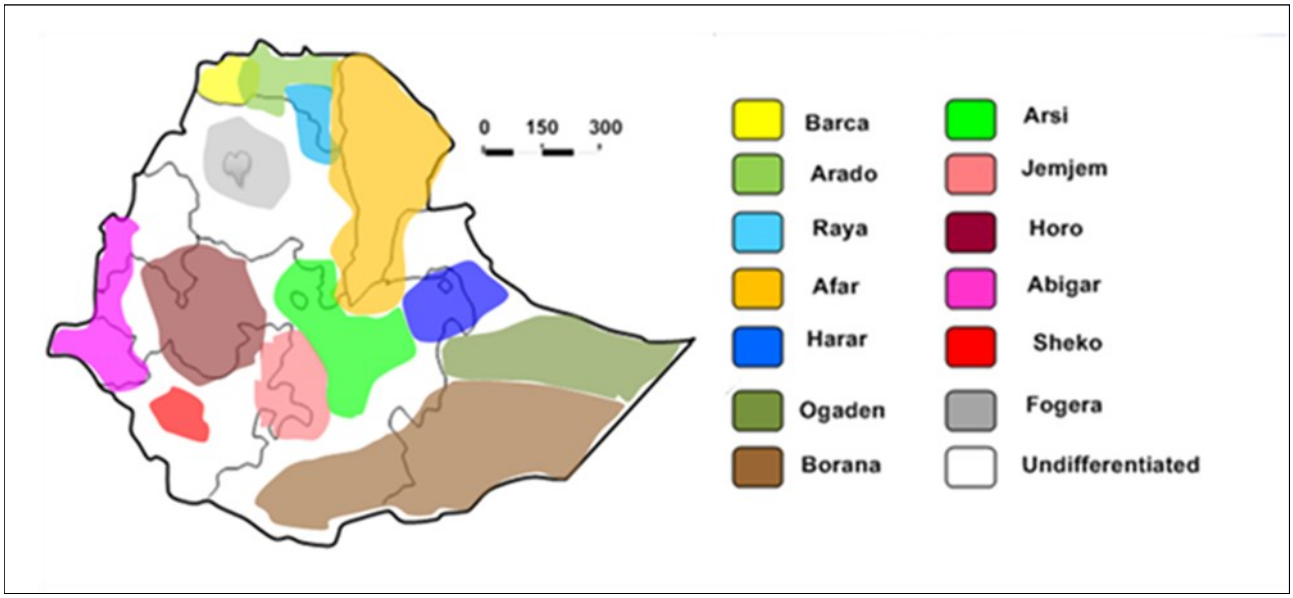
Figure 2. 1 Interaction of farming systems :Representation of cattle, cereal and market rotation loops in Ethiopia

Plate 2. 1 A cattle herd of Mursi tribe and animal body art showing their extreme affection to their animals indicative of one of the best human animal bond and animal welfare, explained as to be adhering to what he called "The Cattle Complex", in which a strong attachment to cattle to the point of irrationality. There are annual cattle counts. The cattle are compelled to jump a gully or to cross a muddy area. Those stronger that can jump and cross are only counted, the weak are eliminated.

Table 2.1 . Description of indigenous cattle breeds of Ethiopia

Breed	Class	Location	Population	Manage-ment	Brief description
Abigar (Neolithic)	Sanga	Illubabor, Keffa	548,650	Agropasto-ral	MBW, 350 Kg; HAW120, cm; HRL 35, cm; CCL red or black pied; Crescent shaped horn.
Arado (Adwa)	Zenga	Tigray	440,000	Sedentary	MBW, 300 Kg; HAW, 120 cm; HRL, 25 cm; CCL, 75% are reddish brown; upward curving horns
Arsi	Small Ze-bu	Arsi, She-wa, Bale	2,011,800	Sedentary	MBW, 250 Kg; HAW, 125 cm; HRL 20, cm; CCL, red, white or light gray
Barca (Begait)	Large Ze-bu	Tigray, Gondar	500,000	Pastoral	MBW, 380 Kg; HAW, 135 cm; HRL, 15 cm; CCL, 85% white and black or brown; ears are long and bell shaped; horns are loose hanging down.
Borana	Large Ze-bu	Sidamo, Bale, Oga-den	1,896,135	Pastoral	MBW400, Kg; HAW, 130 cm; HRL, 15 cm; CCL, 100% plain white. horns are erect thick at the base
Danakil (Adal)	Sanga	Tigray, Wollo, Afar, Ha-rar, Shewa	680,000	Pastoral	MBW 275, Kg; HAW, 120 cm; HRL, 30 cm; CCL, 75% are cream or brown; lyre shaped horn
Fogera (Wagera)	Zenga	Gondar, Gojam,	868,000	Sedentary	MBW, 280 Kg; HAW, 125 cm; HRL, 25 cm; CCL, white with black spot or patches; upward and out ward horns
Goffa (Knosso)	Small Zebu	Gamu-Goffa	300,000	Agropasto-ral	MBW, 280Kg; HAW, 115 cm; HRL, 25 cm; CCL, plain black or reddish brown. Wedge like horn
Harar	Small Ze-bu	Harar	1,143,815	Sedentary	MBW, 250 Kg; HAW, 115 cm; HRL, 12 cm; CCL, 70% are Roan and red
Horro	Zenga	Wellega, Ilubabor, Keffa, She-wa	3,286,080	Sedentary	MBW, 280 Kg; HAW, 120 cm; HRL, 30 cm; CCL, 60% brown or reddish brown
Jem-Jem (Black Ze-bu)	Small Ze-bu	Sidamo	434,000	Sedentary	MBW, 250 Kg; HAW, 115 cm; HRL, 15 cm; CCL, 90% solid black.
Ogaden (Jijiga,)	Small Ze-bu	Hararghe	200,000	Pastoral	MBW, 250 Kg; HAW, 115 cm; HRL, 15 cm; CCL, 60% are chest-nut or white
Raya (Raya Aze-bo)	Sanga	Tigray, Wollo, Afar	521,000	Agropasto-ral	MBW, 380 Kg; HAW, 130 cm; HRL, 90 cm; CCL, 30%chest nut 30 ash gray and black spots
Sheko (Goda, Mizan)	Hump less short horn	Kaffa	31,000	Agropasto-ral	MBW, 250, Kg; HAW,110 cm; HRL,10 cm; CCL, brown or black and white; Jersey like.

(MBW= Mean Body Weight; HAW=Height at Withers; HRL= Horn Length and CCL= Coat color)



2.2 Figure. Distribution of cattle breeds

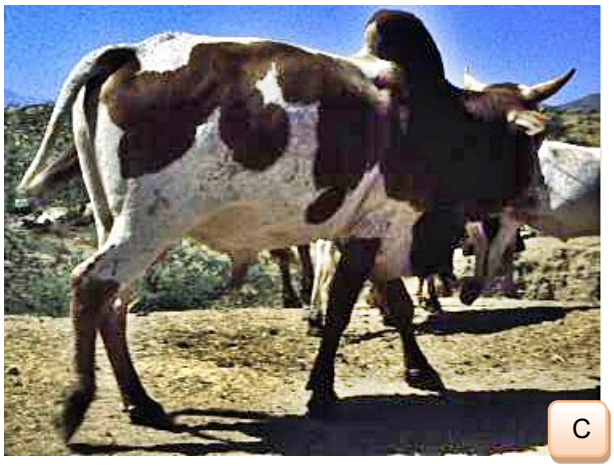


Plate. 2.2 Ogaden cow (A), Ogaden bull (B) Arado oxen (C) and Arsi oxen (D)
Ogaden are the same Variety to Ethiopian Boran they have short horns and compact body good as beef animal, Arsi breeds were used in crossbreeding with Holstein Frisian. The cross breed had hybrid vigor and they had better adaptation to local climate and resistance to disease.

Plate 2.3 Sheko bull (E, F), Sheko heifer (G), Abigar bulls (H,I) Abigar cow (J) a herd of Horro (K) and a Horro bull (L) The Sheko are hump less cattle of the subspecies Bos taurus and they are reputed for their tolerance to trypansomosis . Horro breeds have a brownish brick red skin color and almost 90 percent are uniform. Abigar tolerate harsh environment and trypanosomosis.

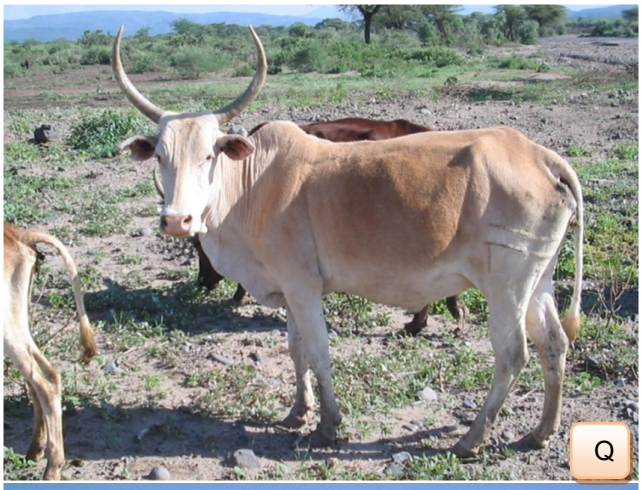


Plate 2.4 Raya breed (M and N), Borana (O and P), Afar (Q and R) and Barka (S and T).
The Barka and Borana have slightly higher milk averages. The Barka breed are excitable, care should be made during handling and they are not good for ploughing . All the indigenous cows have very high maternal instinct, they do not give milk in the absence of their calves and production is low. However they survive on harsh environment with poor quality feed, water and resistance to disease.

Plate 2.5 Harar (U) Fogerra (V,W) , Arado(X,Y,Z), Mizan(Ψ ,Ω). Harar breeds are reputed for beef. Foggera are resistant to internal parasites they inhabit water logged area. Arado are good ploughing animals and docile. Mizan breed cattle are tolerant to fly bites they have upward erect horns sometimes the ends of the horns meet. The people who own them drink blood meals from these animals , they decorate the body of their animals with various arts.

CHAPTER 3: DONKEY BREEDS

The donkey is assumed to be domesticated 5000 years ago (Protsch and Berger, 1973) in the Nile valley, Nubia and what at present is known Ethiopia (Encyclopedia Britanica 1972). The donkey originated from two wild subspecies *Equus asinus somalicus* (Somali wild ass) and *Equus asinus africa*nus (Nubian wild ass). The Somali wild ass has a leg strip while the Nubian wild ass has a shoulder stripe (Wilson 1990). The Nubian wild ass is extinct may be some could be found in zoos around the world and there are only 200 Somali wild ass remaining in the wild in the Afar sanctuary (Dent, 1972; Camac 2000).And they are in the verge of extinction and no conservation programme is underway. The modern donkey *Equus asinus asi*nus is a descendent of these two wild species. There are two breeds of *E.a asinus* namely the Sinnar and Abyssinian asses. While the Sinnar is a different in origin, it is abundant in Sinnar province Sudan, only males are sold to Ethiopian farmers. These breed is introduced from north Africa or Asia. Its larger in body size and absence of any stripes on the body suggest the Sinnar could be descendent of *Equus kiang* and other Asiatic wild asses. The breeds are further classified in to various morphotypes based on coat color. Abyssinian donkey weights 119kg and the height at withers was 94 cm. The domestic donkey in the tropics is small hardy animal, it rarely exceeds 110 cm at the withers and majority of animals were much smaller than 150 kg. . Conversely the various

attempts to classify African asses into breeds revealed little recognized differentiation among donkeys of Africa, this is probably due to lack of breed characterization studies (Wilson 1990).

Ethiopia posses approximately half of Africa's equine population with 37%, 58% and 46% of all African donkeys, horses and mules (FAO 1996; Jahnk, 1992). Ethiopia has 3.9 million donkeys which makes 10 % of the world population (Fielding, 1991). Donkeys are found all over Ethiopia in the highland the density is high 0.32/ km^2 while in the lowlands the density is low 0.042/km^2 (Gebreab, 1999). Donkeys are tolerant to high environmental temperature 45^{o}C. Together with camels, they are used in salt trade caravan where no other domestic animal survives (Wilson 1990). Donkeys in Ethiopia have multiple uses; for packing 97%, wheeled cart 1%, ploughing 0.5% ,riding 0.5 %, meat 0.0005% milk, (negligible only as medicine) and others like threshing of crop and in oil mills 1% (Gebreab et al 1997). Although donkeys are both widespread and economically important to their owners they are rarely studied and are not subject to any improvement, development or loan scheme (Sevndson, 1986). In fact the basic stock is considered to be poor because of random breeding in nature and information gap on breeds and reproduction performance is immense it is always assumed to be similar to horse. The very little available data on donkey reproduction and if it exists is mainly of temperate origin.

Table 3.1 . Body dimensions of local donkey breeds

Breed/ Strains (n)	f (%)	MBW (kg)	HAW (cm)	CHG(cm)	LS(%)	SS(%)
Abyssinian	99	108.3±7.1	96.2±2.0	102.6±3.2	80	100
Mousy grey (248)	65	94.6 ± 3.1	95.6 ±3.1	103.5 ± 4.3	96	100
Grey brown (105)	20	119.4 ± 9.3	98.6 ±7.9	105.6 ±3.2	87	100
Black(44)	11	120.2 ± 9	94.2 ±2.4	99.7 ±0.9	1	100
Pied(3)	2	94.6 ± 2.9	95.5 ± 0.3	102.5± 5.1	1	100
Pink(7)	1	126.6± 0.5	102.3±4.1	106.2±0.5	0	100
White(1)	0.005	95	93	101	0	0
Sinnar (3)	1	170.7±11.4	115.3 ±3.7	113 ± 2	0	0
Grey (1)	0.3	160	111	114	0	0
White (1)	0.3	182	120	115	0	0
Black (1)	0.3	170	115	110	0	0
Somali	Only about 200 remained in the Awash sanctuary					

(MBW=Mean Body Weight, HAW= Height at Withers ; CHG= Chest girth; LS=leg stripe, SS= Shoulder Stripe and f=Frequency)

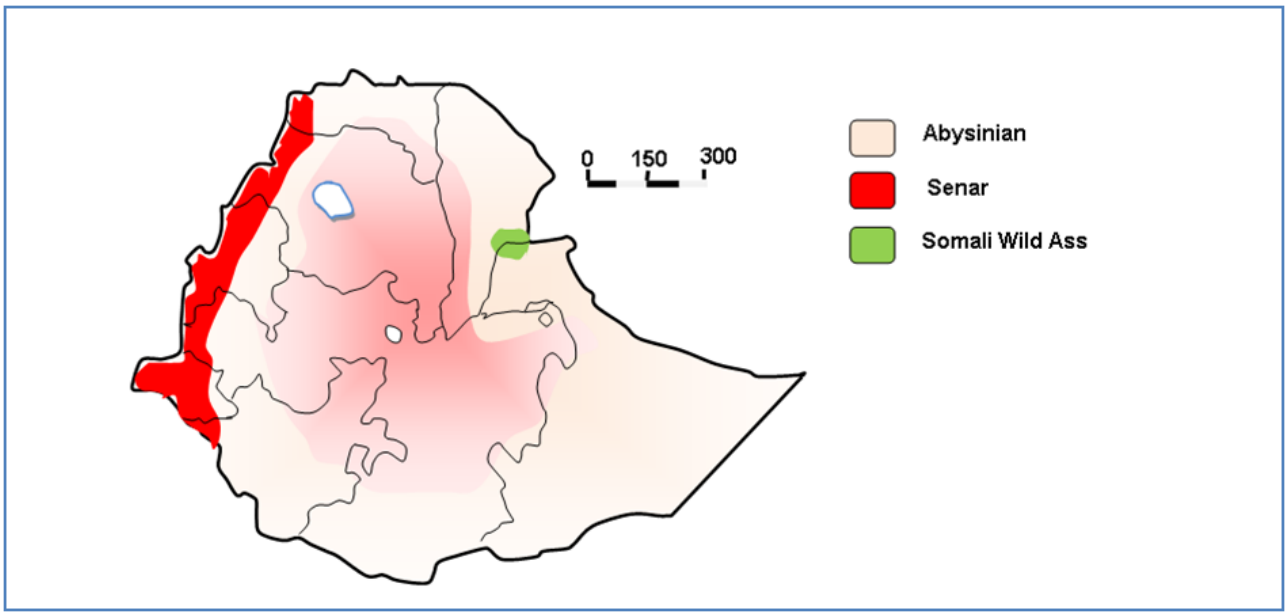
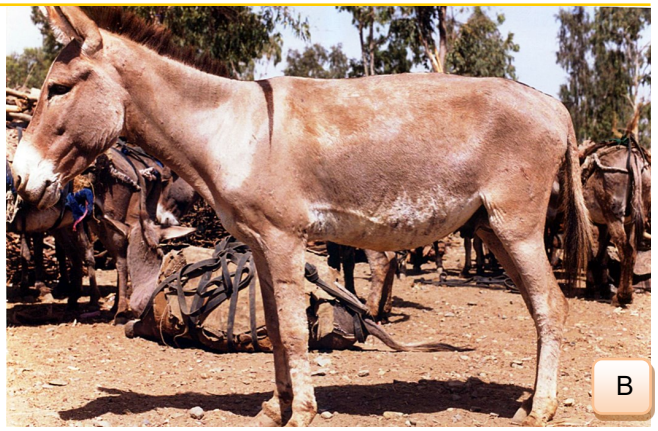


Figure 3.1. Geographic distribution of donkey breeds



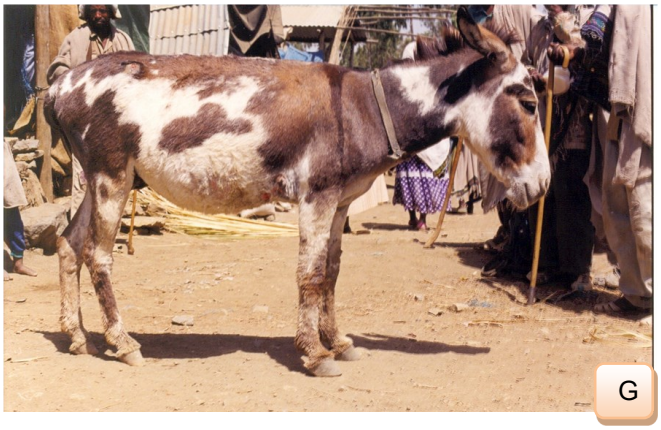


Plate 3.1 (A) white , (B) pink (C) mousy gray no leg stripes, (D) black– long hair pied (E) black short –hair , (F) brown (G) Pied and (H) excessive body striped

The dominant color is mousy grey, black and white were not common (Wilson 1990; Tsega 1995). While the Sinnar weights 170kg and the height at withers is 111cm. Gebreab (1997) describes the Sinnar donkey 100-114 cm in average size.

Plate 3.2 (j) mousy gray normal leg stripe showing its genotype from Somali wild ass. (J and k) Senar donkeys. *Equus assinus assinus* descended from two wild subspecies, namely *Equus asinus* somalicus (L) and Equus asinus africanus. (M) While the Sinnar is a different in origin, apparently it was introduced from north Africa or Asia its larger in body size and absence of any stripes on the body suggest the Sinnar could be descendent of Equus kiang (N).

The Sinnar donkey is used for riding in Sudan, as pack and pulling cart. In Ethiopia Jacks are mainly used for crossing with mares resulting in mules. There are about half a million mules in Ethiopia. Almost all are produced by Equine masters in Gojam and Gondar , Northwestern Ethiopia. Apparently, the Sinnar donkey is only present bordering Sudan. And no Sinnar breeds are found outside this area. Nor the Sinnar Genets are bred in Ethiopia.

CHAPTER 4: CAMEL BREEDS

All camel in Ethiopia belongs to dromedary (*Camelus dromedarius)*. The history and origin of the domestic camel remain elusive when compared with those cattle and small ruminant. A molar tooth and metatarsal bone was found by a team of paleontological research in Ethiopia in lower Omo valley. The fossil dates 2.6 million year (Pleistocene) seem to belong those of Bactrian camels and it is first camel remains to be recognized in eastern Africa (Howell, *et al*; 1969). However during the Holocene period, Bactrian camel became extinct in Africa (Kohler, 1993 cited by). The one-humped camel or dromedary is generally thought to have evolved from the two-humped Bactrian species. This theory is partly based on embryological evidence showing that during prenatal development the dromedary fetus actually has two humps (De la Tour, 1971),(Cited by Mukasa-Mugerwa, 1981) while a vestigial anterior hump is present in the adult. Williamson and Payne (1990) speculate that the one-humped species probably evolved in one of the hotter and more arid areas of western Asia. Dromedaries were probably domesticated in coastal settlements along the southern Arabian Peninsula somewhere between 3000 and 2500 BC (Wilson, 1984). Once in Africa, Mikesell (1955) suggests that the camel spread west and southwards from Egypt, although Bulliet (1975) is of the view that the camels of the Horn of Africa are more likely to have come across the sea from the Arabian Peninsula than spread southwards from Egypt and Sudan. Curasson (1947) and Epstein (1971) indicate that the dromedary was introduced into North Africa (Egypt) from southwest Asia (Arabia and Persia).

The camel was introduced in Ethiopia around 1000 BC. There are historical accounts by which Queen of Sheba of the ancient Abyssinia kingdom at the head of a caravan of riches, she visited Israel's king Solomon and established trade in the Middle East. However, those camels in Eastern Ethiopia they were introduced around 500 AD together with the introduction and spread of Islam. (Tefera, 2004). Archeological evidence point out that a camel tooth, was discovered in Axum probable date 500 AD (Philipson, 1993). While there is evidence of Cave Painting of Lega –Oda near Diredawa depicted on Plate 1.4 F, dated to the 1st centaury AD. Thus the camels in North and Eastern Ethiopia appear to be distinct breeds. Thus two routes of introduction were suggested as shown on Figure 1.1.

Breed classification based on location

Each tribe and clan is a closed system of relationship, every social activity takes within the clan. For example the clan may share a camel bull for breeding , herds of camel and exchange live animal gifts. Although external features of the camels are not distinct, sometimes the camels are classified after their locality like Kunama camel, Afar camel , Somali Camel, Borena camel, Kereyou camel. However, the Irob, Kunama and Raya they obtain their stock from the Afar, usually males that they use them in transporting merchandise.

Breed classification based on color

The kunama camel are distinct whitish and it is unrelated to the Afar and Somali camels. Probably due to its origin from North Africa via Egypt. The Afar camels are darker while the Somali camels are intermediate golden brown. However a mix of animals lighter and darker may occur in tribal herd. Color is affected by age, younger animals tend to be darker. Darker camels are considered low producing but they may possess other beneficial traits of survival.

Breed classification based on size

The Kunama camels are big and taller while the Afar camels are lighter and Somali camels intermediate. Size is affected by age, sex, plain of nutrition. As there has never been on station evaluation

Morphometric measurement

Some relevant measurements were used to assess the phenotypic appearance of the Afar camel and Somali camels. The mean height of male and female camel was 1.89m, and 1.82m, respectively, the average mature weight of male camel ranged between 350-500 kg and female weighted between 350-450kg under traditional system. The mean weight of newly born calves was 33.69 kg. While Somali camels were taller as shown on Table 4.1.

Breed classification based on production performance

Milk, meat and work performances are used for selection breeding animals. The trait most selected is milk and some of the characteristics are posture and size of udder and mammary gland and pedigree. Female animals are never used for work as stress may hinder them from reproducing. Except the breeding bull, all males are used for packing goods after they are trained to fit in to a line caravan at age 5. Three types of camels are identified based on milk production, high yielding up to 10 liters, intermediate 7-5 liters and small 4-3 liters per day.

As it is difficult to differentiate the camel breed based on external appearance a tribal herd of camel may be branded with identification mark to know to which tribe it belongs . Moreover, variation in breeding success rate between males is a main source of phenotypic selection pressures. No female is culled.

Table 4 .1 Morphometric variables for Afar Male camels under pastoral husbandry.

Morphometric variables Mean (cm)	Afar*		Somali**	
	male	female	male	female
Neck length	114.95	118		
Neck width	29.65	26		
Hump height	21.8	26.9		
Hump circumference	102.3	110.5		
Tail length	54.6	53.5		
Ear length	10.5	10.4		
Chest width	36.4	32.8		
Forelimb length	136.8	133.4		
Hind limb length	175.5	171.1		
Shoulder height	189.65	182.4	1.96	
Thoracic girth	194.5	189.3	2.04	
Abdominal girth	216	212.2	2.52	

*** (Tefera, 2004 unpublished), ** (Getahun, 1998) (Blank data shows data not available)**

Plate 4.1 The Afar camels are lighter in body weight and darker in color (A,B) . The Somali camels intermediate. Size golden in color (C,D). And the Kunama camels are whitish in color big and taller (E,F).
The kunama camel are distinct whitish unrelated to the Afar and Somali camels. Probably due to its origin from North Africa via Egypt. Kunama camel are sometimes called as Barka Breed.
The camel breeders select animals for milk ,one criteria is prominent mammary vein as shown in G . Camel bulls are selected day old having good conformation at birth and pedigree are the main criteria (H)

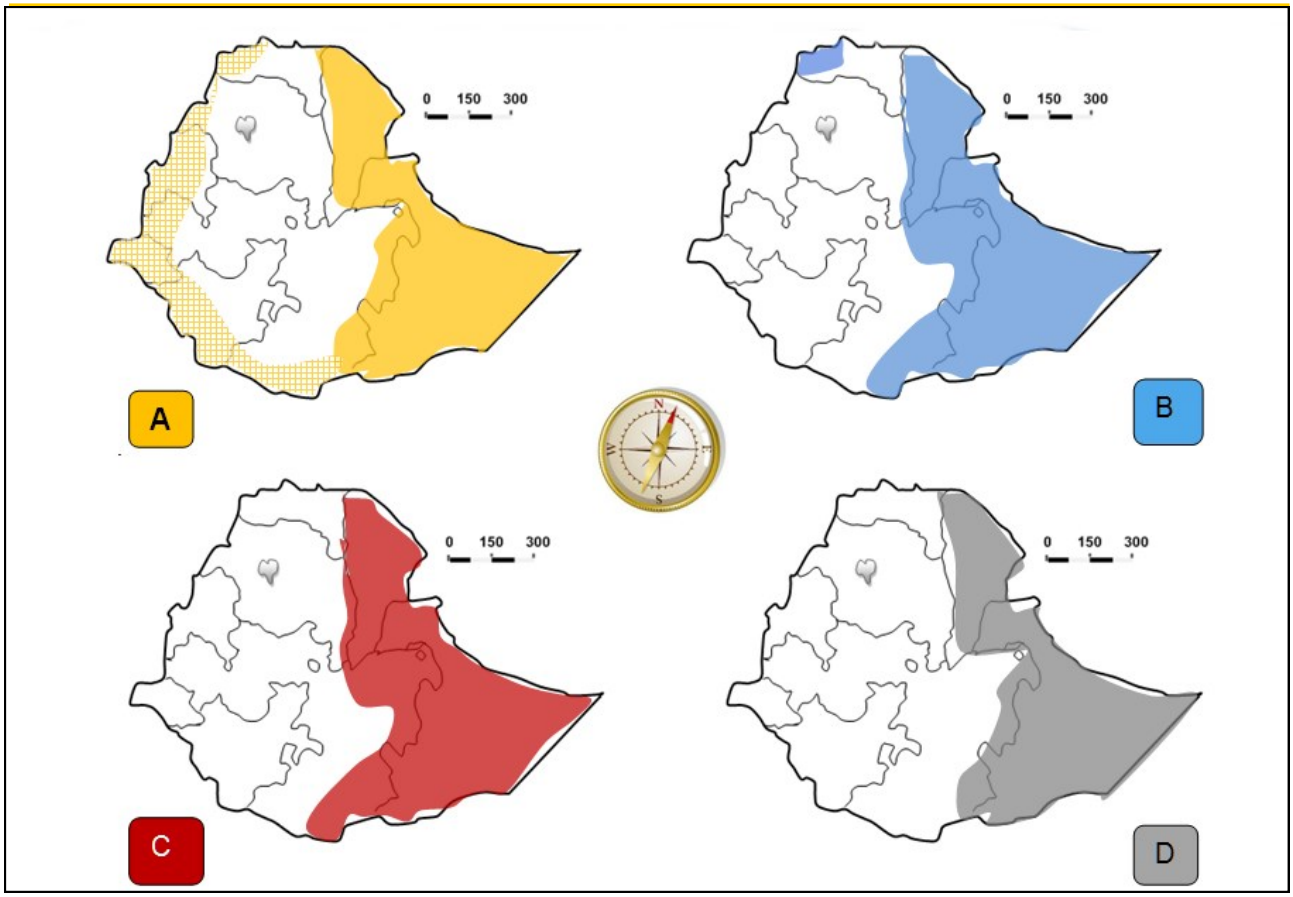


Figure 4. 1. Outline maps of Ethiopia. The shaded area on (A) shows the lowlands (<1500m above sea level). The shaded area in (B) show the distribution of camels, that in (C) shows the absence of horses and mules and that in (D) the area in which Islam is the religion. The camel is absent from Southwest lowlands probably due to Infestation of tsetse flies (Area shaded rough in (A).

Plate 4.2 Camel caravan parking waiting to be loaded with salt in Berahle, Afar

CHAPTER 5: SHEEP BREEDS

The process of domestication of sheep seems to have started about 10,000 years ago in southwestern Asia. The exact line of descent between domestic sheep to their wild ancestors is presently unclear. The most common hypothesis states that *Ovis aries* is descended from the Asiatic (*O. orientalis*). It has been proposed that the European mouflon (*O. musimon*) is an ancient breed of domestic sheep turned feral rather than an ancestor, despite it commonly being cited as ancestor in past literature. The Urial (*O. vignei*) was once thought to have been a forebear of domestic sheep, as they occasionally interbreed with mouflon in the Iranian part of their range however they have a different number of chromosome.

In Ethiopia there are 23 million sheep in the highland and lowlands,. The domestic sheep is a multi-purpose animal they are used as means of cash, meat, milk, export, skin. Some sheep breeds are evaluated for their production potential on station like Menz and Horro. But many remain unstudied. Their merits are resistance to disease adaptation to harsh environment and good quality skin.

Ethiopian highland sheep skins and hides provide a strong base for finished leather and leather products production. The sheep skin in particular has a reputation for its fiber strength and other qualities attractive to the international market which are best suit for dress gloving and upper part of shoe.

In the past exotic breeds like Merino, Suffolk, Awasi and Dorpper sheep were tried. With poor adaptation and introduction of exotic diseases . However, local sheep have greater potential for meat like Horro, and milk like the Barka breeds while Menz and Tikur breeds produce coarse wool used to make floor carpets.

Almost all sheep are produced in the traditional system. In the future intensification and stratification strategy, lambs from low nutrition area could be transferred into feedlots and finished until marketing.

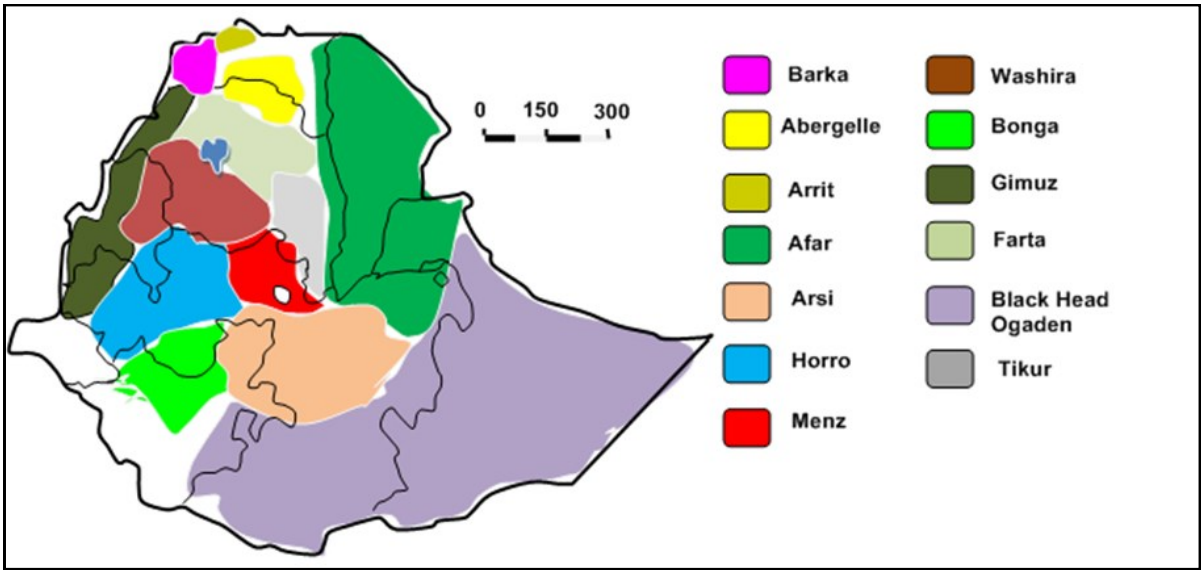


Figure 5. 1 Distribution of sheep in Ethiopia

Plate 5.1Ancestors of domestic sheep (*O. aries*) .Above, The Urial (*Ovis orientalis*) and below the mouflon (*Ovis musimon).*

Table 5.1 Indigenous sheep breeds of Ethiopia

Breed	Location	Population	Management	Brief description
Abergelle	Tigray	100,000	Sedentary	MBW, 35kg;HAW, 65 cm; COC, Short hair; TYT, fat tailed; HOT, polled; ERL, 3 cm; CCL, reddish brown
Afar (Adal)	Afar, Wollo	1,200,000	Pastoral	MBW, 40 Kg; HAW, 70 cm; COC, short hair; TYT, long fat; HOT, polled; ERL, 2 cm; CCL, blond white to light brown; have dewlap.
Arsi-Bale	Arsi, Bale	1,800,000	Sedentary	MBW, 30; HAW, 68cm; COC, course wool; TYT, fat tailed; HOT, coiled; ERL, 12 cm, rudimentary in females; CCL majority light brown, gray or roan
Arrit	Tigray, Gondar	50,000	Pastoral	MBW, 38; HAW, 73 cm; COC, short hair; TYT, thin long; HOT, polled; ERL; CCL, blond, white or red pied
Barca	Tigray, Gondar	20,000	Pastoral	MBW, 40kg, HAW, 75cm; COC, short hair; TYT, thin long; HOT, polled; ERL, CCL, white
Black Head Ogaden	Hararghe, Bale, Sidamo	1,100,000	Pastoral	MBW, 38kg; HAW, 65CM;COC, short hair; TYT, fat rumped, HOT, polled; ERL 8cm; CCL, black head and white body
Bonga	Keffa	100,000	Sedentary	MBW, 38kg; HAW, 70cm;COC, short hair; TYT, thick long, HOT, polled; ERL 5cm; CCL,
Horro	Wellega, Keffa, Ilibabor, Gojam	1,500,000	Sedentary	MBW, 35kg; HAW, 70cm;COC, short hair; TYT, rooted, HOT, polled; ERL polled; CCL, 75% Light brown
Menz	Shewa, wollo	1,700,000	Sedentary	MBW, 35kg; HAW, 68CM;COC, coarse wool; TYT, fat tailed, HOT, coiled; ERL 12cm; CCL, brown, or black with white spots
Tukur	Wello	750,000	Sedentary	MBW, 40kg; HAW, 75cm;COC, course wool; TYT, fat tailed, HOT, coiled; ERL 13cm; CCL, plain white or black and black and white

(MBW= Mean Body Weight; HAW= Height at withers; COC= Coat Cover; TYT= Tail Type; HOT= Horn Type; ERL= Ear Length and CCL= Coat color)

Plate 5.2 . Afar (A,B) , Abergele (C,D) , Horro (E) , Black Head Ogaden seep (F), white Strain of the BlackHead Ogaden sheep (G) and Farta (H).

There are four basic tail types in domestic sheep long-tailed, short-tailed, fat-tailed and fat-rumped.
It is assumed that fat tailed breed of sheep store food in the tail when food is plenty and use this stored energy during scarcity . Fat storage , which is possible for high intake of high quality grass during lash periods may be energetically more efficient than forage conservation to counteract the characteristic fluctuation of food supply in tropical production system (Orskov (1988) .

Plate 5.3 Menz (I) Washira (J) , Tikur (K), Tikur white strain(L) Barks (O,P). The carpet on K is made of the Tikur Breed which has a white and Black strains. The Menz sheep has the longest coarse wool among the endogenous breeds.

Almost all breeds in Ethiopia are wool less or hairy breeds. Those in the highlands have coarse wool like the Menz. But wool breeds in general thrive poor in the tropics .Most hair breeds have better resistance to parasites than wool breeds. Sheep Keds which typically which hide in wool are easier for a hair sheep to rub off . Parasites, like worms, also seem to occur less often in hair breeds.

CAPTER 6: GOAT BREEDS

The goat (*Capra hircus*) was one of the first domesticated ruminants. Goats were domesticated from the wild version of *Capra aegagrus* about 10,000 years ago, by Neolithic farmers in the Near East (Devendra, and Burns, 1983). It is the most adaptable and geographically widespread livestock species. Domestic goats provide a full range of useful products to human society (meat, milk, and fiber), and this makes the goat one of the most useful animals that humans have ever domesticated (Porter, 1996). The origin, genetic diversity, conservation, and sustainable utilization of this species have received close attention for a long time.

Goats are found in all agro-ecological zones from hyper-arid to super-humid and over the whole range of production systems from intensive smallholder production to very extensive nomadic pastoralists (Payne and Wilson, 1999). Goat production in Ethiopia is categorized under low input production system and is operated by smallholder farmers.

According to CSA (2010) there are about 21.96 million goats in Ethiopia. Goats were characterized by FARM-Africa (1996) , Since then little further effort has been made towards an in-depth genetic characterization of indigenous goat breeds. A lack of information on genetic resource may lead to the underutilization, replacement and dilution through crossbreeding of local goat breeds, despite their local adaptation to environmental constraints.

Inadequate attention was given to evaluate these resource or to setting up realistic and optimum breeding goals for their improvement. Wrong policy to use narrow range exotic genotypes such as Anglo Nubian goats; in the past resulted in failure .

Sheep and goat skins rank among the largest export commodities of Ethiopia. Goats skin named as *Bati* genuine are best suitable for sued leather (mainly used for shoe upper and leather goods) and offers them premium prices.

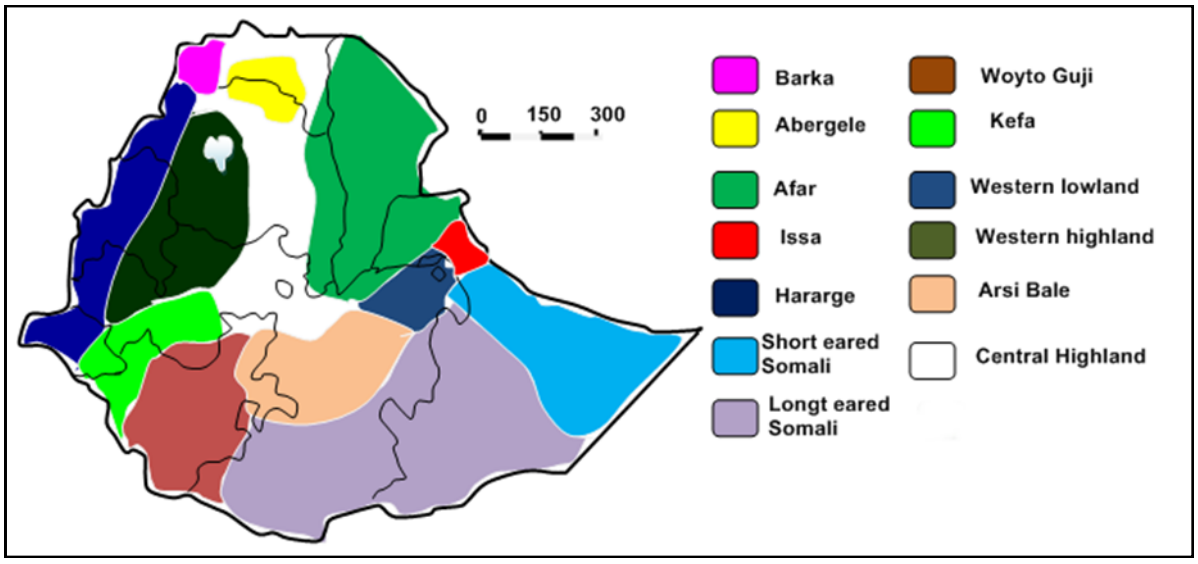


Figure 6.1 Distribution map of indigenous goat breeds

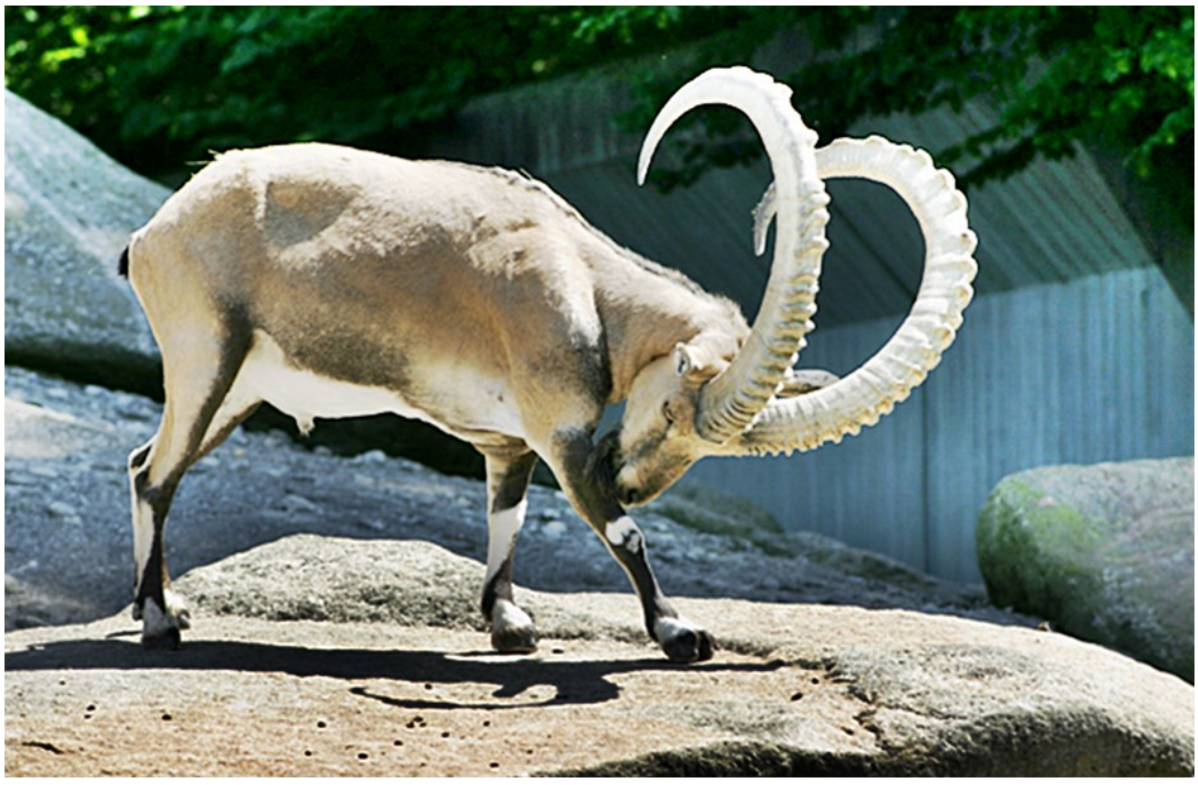


Plate 6. 1 .*Capra aegarus* ancestor of the modern domestic goat Capra *hircus*

Table 6.1 Description of Indigenous goat breeds of Ethiopia

Breed	Location	Population	Management	Brief description
Abergelle	Wollo, Tigray	200,000	Agropastoral	MBW, 30 Kg; HAW, 68 cm; ERL 12 cm; HRL, 40 cm, twisted backward.
Afar (Widar, Danakil)	Afar, Wollo, Tigray, Harar	1,000,000	Pastoral	MBW, 25 Kg; HAW, 55 cm; ERL 11 cm, HRL, 12; they are dwarf.
Arsi Bale (Gishe)	Arsi, Bale	300,000	Sedentary	MBW, 38 Kg; HAW, 70 cm; ERL, 14 cm; HRL,14, convex; facial profile is straight, long haired.
Barka (Begayit)	Tigray, Gondar	150,000	Pastoral	MBW, 40 Kg; HAW, 70 cm; ERL, 19 cm; HRL, 12cm, back word directed females are polled; Ear belle shaped; facial profile is convex; 75% are white with brown patches. Large udder
Central Highland	Tigray, Wollo, Shewa	6,000,000	Sedentary	MBW, 38 Kg; HAW, 72 cm; ERL, 13 cm; HRL,17cm ; thick horn; 60% are reddish brown
Harar	Haraghe	1,000,000	Sedentary	MBW, 35 Kg; HAW, 65 cm; ERL, 13 cm; HRL,14 ; 50% are polled.
Issa	Hararghe	200,000	Pastoral	MBW, 30 Kg; HAW, 70cm; ERL, 14 cm; HRL, 12 ; 80% are white.
Keffa	Keffa	1,000,000	Sedentary	MBW, 32 Kg; HAW, 68 cm; ERL, 13 cm; HRL, 20 ; short neck; concave face.
Long Eared Somali	Hararghe, Bale, Sidamo	2,000,000	Pastoral	MBW, 35 Kg; HAW, 68 cm; ERL, 12 cm; HRL, 10 ; 76% are white
Nubian (Shekorea)	Tigray, Gondar	100,000	Pastoral	MBW, 38 Kg; HAW, 72 cm; ERL, 20 cm; HRL,15 cm, females are polled; 72% are black; the face is convex; .lop-eared, Large udder
Short eared Somali	Hararghe	100,000	Pastoral	MBW, 30 Kg; HAW, 62 cm; ERL, 12 cm; HRL, 14 ; 75% are white.
Western Highland (Agew)	Gojam, Wellega, Illubabor	3,000,000	Sedentary	MBW, 42 Kg; HAW, 75 cm; ERL, 14 cm; HRL, 16 ; concave face; 80% are white or fawn.
Western Lowland (Gumez)	Gojam, Wellega, Illubabor	400,000	Pastoral	MBW, 31 Kg; HAW, 63 cm; ERL, 13 cm; HRL 15cm . (Strain of Barca)
Woyto-Guji (Konsso)	Sidamo	900,000	Agropastoral	MBW, 35 Kg; HAW, 68 cm; ERL, 12.5 cm; HRL, 11cm ; they have straight facial profile; short neck; broad face.

MBW= Mean Body Weight; HAW= Height at withers; HRL= Horn Length; ERL= Ear Length .
(Barka, Nubian and Gumez are same variety).

Plate 6.2 Barka (A,B) , Short-eared Somali (C) , Long-eared Somali (D), Rift valley (E,F), Abergele (G,H) and Afar

The Barka goats are good milking goats up to 3 l/day , Abergele are good for meat they have the longest horn and body frame they are one of the largest goats in Ethiopia, the Afar breed are small longer anterio -posterior than dorso-ventral, they can be bred as micro goats for experimental purpose.

Plate 6.4 Abergelle Goats in Mekelle Market

CHAPTER 7: HORSE BREEDS

The domestic horse *Equus. cabalus* originated from wild horses *E.c.przewalskii, E.c. caballus, E.c. pumpelli, E. c. mosbachensis and E.c. ferus*. Physically Ethiopia horses are a mixture of *E.c.pumpelli* (Afro Turk) and *E.c.caballus* (Northwestern European), (Millar, and Lambert . 2013)

E. przhevalskii, now native to western Mongolia only, but formerly found over a much wider range is the only extant true wild horse, it crosses with the domestic horse and produces fertile progeny (Grooves, C.P. 2000).

The horse period in Africa is usually dated between 2000 and 1200 BC. Saharan Africans used the donkey and later horses as beast of burden.

The horse is not mentioned or depicted in any of the Axumite civilization (1st millennium AD). In Ethiopia wild Horses exist in Harar region Kundido. However these horses that live wild are not really wild horses in the zoological sense, apparently they are domestic horses in the wild (Feral horse). Ethiopia has two million horses which makes it 50% of all African horses. Except in the peripheral lowlands horses are found all over the country Certain parts of Ethiopia are suitable for equine breeding such as Gojam and Gondar it is profitable business to breed and to sell donkeys mules and horses further south. In Ethiopia the mule is more expensive than the horse and used primarily for riding (Payne et al., 1999).There are two well-known types of mules in Ethiopia. The sinnar mule and the Wollo mule. The sinnar mule is characterized by fine lines, long and slender legs and it is generally elegant. The Wollo mule is more rustic, grayish or black, and resembles much more to the donkey than the horse.

Horses and mules have been both prestige and power symbols, This equestrian culture has been very strong in Ethiopia, and this until very recently. There are poems dedicated to horses, legends and stories, and, as noted earlier, men of valor were known under the name of their best horse Aba Tatek for example for Emperor Theodoros.

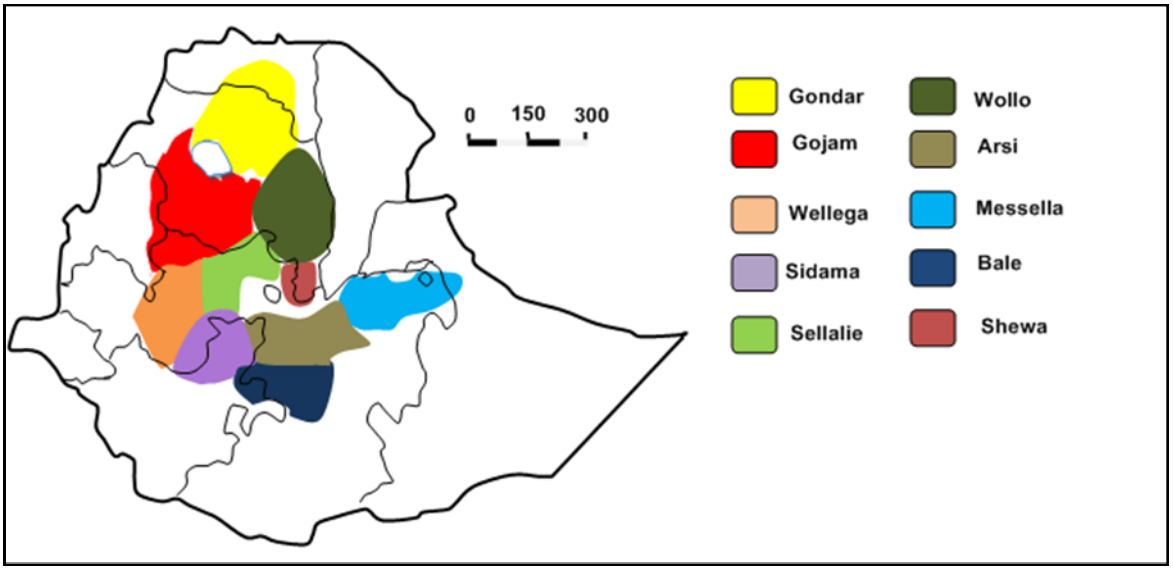


Figure 7.1 Distribution map of horse breeds

Plate 7.1 Somali pony (A), Jimma horse(B), dongola horse(C), Gondor horse(D,E), Shewa horse(F) and Oromo horse(G) and Gojam horse(H).

The Somall pony or Harar pony is short about a meter . Dongola horse are 1.5 m they are from Sudan. And the Abyssinian horse have no distinct futures mainly exist as ecotype(Jimma, Gondar , Shewa, Bale , Gojam) they are about from 1.20m to 1.30m. The greater proportions of horses are brown, to brick red in color.

Horses in Ethiopia are not well differentiated categorically, they are absent in the lowlands. In the highlands where there are steep cliffs mules are preferred to horses. The Cart horses in lowland towns are purchased from breeders in the highlands.

Plate 7.2. Sinnar donkey used for mule breeding (I) and feral horses in Kundido Harar (J) They are not ancestors of modern hors they are simply domestic animals living in the wild. The ancestor of domestic horse is shown on (K) *Equus pres*evalski

There are three types of mules The wollo, bred from local donkeys and the Sinnar mule from Sinnar and a third type from crossbred of Sinnar donkey. Mules are produced in Gojam and Gondar and they are sold throughout the country. There are big seasonal during April-May

Most of the horses resemble Arab horse and they are used for riding, packing, pulling carts and block carts, sometimes racing, in Gojam as plough animals and threshing crops.

Figure 7.2. Cart horse taxi in Dessie wollo localy know as the Gari.

CHAPTER 8: CAT BREEDS

Cats were domesticated in the Near East, probably coincident with agricultural village development in the Fertile Crescent. Domestic cats derive from at least five founders from across this region, whose descendants were transported across the world by human assistance: *Felis silvestris silvestris* (European wildcat), *F. s. lybica* (Near Eastern wildcat), *F. s. ornata* (central Asian wildcat), *F. s. cafra* (southern African wildcat), and *F. s. bieti* (Chinese desert cat)—indicated that each wild group represents a distinctive subspecies of *Felis silvestris.* African Wildcats diverged from the other Wildcat subspecies about 131,000 years ago. Some individuals were first domesticated about 10,000 years ago in the Middle East, which are the ancestors of the domestic cat.

The African Wildcat is a subspecies of the Wildcat (*Felis silvestris*) and is similar in size to domestic cats. In fact the African Wildcat is the ancestor of domestic cats. The African Wildcat is also known as the Desert Cat, African Desert Cat or simply Wildcat. The African Wildcat looks similar to a short-haired domestic tabby cat, but has reddish coloring on the back of the ears, over its abdomen and on the back of its hind legs.

Domestic cat (*Felis c*atus), also called house cat, domesticated member of the family Felidae, order Carnivora, and the smallest member of that family. The history of our modern day cat (*Felis silvestris catus*) .

There are more than 100 recognized breeds of domestic cats. Some cats are the result of natural breeding, while others are the result of specific breeding practices. When it comes to cat breed characteristics, the features that breeders look at are: body type, coat color, eye color length of coat and personality.

In Ethiopia there exists wild cat *Felis silvestris*. But no study has been conducted to study their genetic diversity. In Ethiopia there exists two breeds namely the Abyssinian and the Somali cat breeds known also internationally.

Abyssinian: This cat breed is one of the oldest. These cats come in red, fawn and blue colors oriental body shape and possess an energetic and affectionate personality.

Somali this breed has long hair ,some proponents think that the long coat was a spontaneous natural mutation in the Abyssinian. They have moderate body shape and more docile of the two.

Plate 8.1 Wild cat *Felis silvestris*

Plate 8.2. Cat breeds in Ethiopia (A,B,C,D) Somali Breed and (E,F,G,H) Abyssinian breed.
These breeds have other strains with different eye colors blue yellow and white additionally other strains with a body size and shape

Silver Tabby

Orange tabby

white

Black

Calico

Bi color

Van

Plate 8.3 . Top row shows the primary colors and the bottom raw crosses of different generations of Somali breed cats.

Melaku Tefera

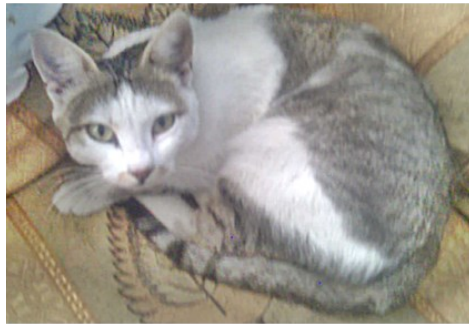
Orange tabby

Silver Tabby

white

Black

Van



Bi color

Van

Bi color

Calico

Calico

Calico

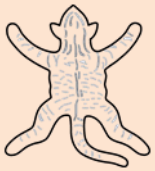
Calico

Plate 8.4 . Top row shows the primary colors and the bottom raw crosses of different generations of Abyssinian breed cats

Table 8.1 Breed Identification Cat Chart

Breed	Body type	Eye shape/eye color	Ears Size/ special futures	Head Shape	Coat color/Length/pattern/ texture	Tail length special futures	Type
Abyssinian	oriental	Round, yellow, white, blue, grey	Small, pointed Large	Triangular	Black, white, spotted tabby, Mackeral tabby, Van, Bicolor, Tortoise shell	Medium cylindrical	Natural
Somali	Moderate	Round smaller, yellow, blue	Small	Small head	Black, white, spotted tabby Mackeral tabby, Van. Bicolor, Tortoise shell	Medium battle brush	Natural

Key:
Body type : Cobby refers to a heavy, short legged; compact, broad-chested body; moderate refers to a well-balanced body of medium length, well-muscled, with no extremes and foreign: Foreign bodies (sometimes referred to as oriental or exotic) are long and tubular to the extreme.
Coat Types: The basic colors are black, chocolate, red, and white, with dilute (lighter) variations within those colors Black—Sometimes called ebony Chocolate—Sometimes called brown, Red—Sometimes called orange or tangerine – A dilute of red is cream, sometimes called yellow, beige, or tan White
Pattern Type: Solid—A solid (self) colored cat is entirely one color. And Tabby—there are four basic tabby patterns: Classic, Mackerel, Spotted, and Ticked.
Texture: soft and bristly
Length: The length of a cat's coat is naturally short. The long hair mutation occurred over many



Spotted tabby

Mackeral tabby

Bi-color

Van

Calico

NB: In addition to these breeds there is a feral cat named in some places as Mitsu is bigger and may reach 40 cm in height.

CHAPTER 9: DOG BREEDS

Domestication of dogs occurred 15000 years ago (Morey, 2006). Fossil and DNA evidence (Savolainen et al., 2002, Lindbald-Toh, 2005 evidence suggests that dogs were first domesticated in East Asia.

The dog was domesticated from wolves since their domestication dogs have become companion of man and are kept as pets . The history of pets is intertwined with the process of animal domestication, and it is likely that the dog, as the first domesticated species, was also the first pet. Perhaps the initial steps toward domestication were taken largely through the widespread human practice of taking pets of captured young wild animals. Eventually, a working relationship developed between the dogs and their human captors.

The first dogs introduced to the African continent were probably of the pariah-type, which came originally from Asia. Primitive dogs such as the Khoi dog (Hottentot dog) share common characteristics with the Asian pariah dogs that are not usually seen in the other dog breeds.

The group of African dog breeds includes not only dog breeds from the African mainland, in Mesopotamia, dogs that look remarkably like the present-day mastiff were shown participating in a lion hunt.

Domestic pets were often depicted in the scenes of family life in ancient Egypt; hunting dogs of the greyhound or saluki type accompanying their master

There are many African dog breeds:

Aidi: A North-African dog, also known as Chien d'Atlas, was originally used as a flock guard and protection dog to defense nomads and their belongings.

Egyptian Armant: Native to Egypt were they were originally used as guard dogs, due to their fearless courage when facing predators and their extreme loyalty to their owners. **Azawakh** (African Greyhound): Description unavailable.

Rhodesian Ridgeback: an exceptional scenthound with a typical crest of reverse growing hair (ridge) on the back. **Sloughi** (Arabian Greyhound): Description unavailable.

South African Boerboel: Description unavailable.

Basenji: is a breed of hunting dog that was bred from stock originating in central Africa. The Basenji produces an unusual yodel-like sound commonly called a "barroo", due to its unusually shaped larynx. This trait also gives the Basenji the nickname "Barkless Dog." Basenjis share many unique traits with Pariah dog types.

In Ethiopia, there is very scarcely any published information on the number and demography of domestic dogs and cats and their impact on public health

Dogs perform a range of cultural, social, and economic functions in society. Dogs are kept as pets and companions, for hunting, as guards, shepherds and never for food in Ethiopia or for commercial purposes, 70% of dogs were aggressive as they were mostly use as guards. For this reason they are reared in isolation as a result they are behaviorally aggressive.

The dog to human ratio in Addis Ababa city was found to be 1:12.4

Plate 9.1 Dog breeds of Ethiopia Abyssinian Coli (A,B,C) and Abyssinian Fox terrier (D,E,F) and the Basenji breeds (G). These dogs are classified based on size ; small (A,D), medium (B,E) and small (C ,F).

Table 9.1 Dog breed characteristic chart

Breed	Abyssinian Coli			Abyssinian Fox Terrier			Basenji
Size	Small	Medium	Large	Small	Medium	Large	Medium
Exercise							
Extreme			x				x
Maximum		x				x	
Moderate	x				x		
Minimum				x			
Coat care							
Maximum		x	xM				
Moderate	xM					x	
Minimum				xS	xL		xL
Shedding							
Behavior							
Friendly	x						
Tolerant		x		x	x		
Solitary			x	x		x	x
Good w/dogs	G	P	P	P	P	P	P
Good w/cats	G	G	P	G	P	P	P
Trainability	T	DT	DT	T	DT	DT	DT
Barks/ digs	B	BD	BD	BD	BD	BD	D

Key:

(G) Good, (M) Moderately (P) Poor

Trainability: (VT) Very Trainable, (T) Trainable, (DT) Difficult to train

Barks/Digs: (B) Tends to Bark, (D) Tends to Dig

Shedding: (E) Extreme , (S) Seasonal extreme , (H) Heavy ,(M) Moderate (L) Light , (N) No shedding.

Size : Giant15 kg. and up Large: 10-15, Medium: 7-10 , Small:6.5. and under

The above dog breed are indigenous. However there are many breed of dogs imported from foreign countries, As breeding is not controlled one may find exotic blood in these dogs. The situation is more in urban dogs than in the rural. Hence care should be taken during sampling for genetic studies.

There are limited dog breed options in Ethiopia, despite people love to own dogs suitable to their needs mostly small space requirement and trainability which the local breeds lack.

Most dogs in Ethiopia are guard dogs and in the rural guarding and shepherding.

CHAPTER 10 : ETHIOPIAN LARGE WILD MAMMALS

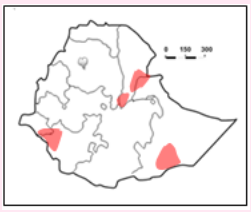
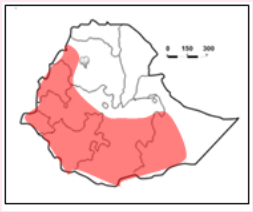
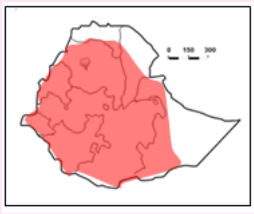
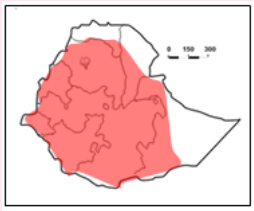
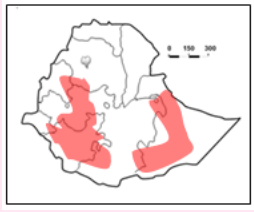
In Ethiopia, overall there are 280 mammalian species and subspecies (Abunie, 1991) . Out of this, 12 of them are endemic large mammals, namely *Canis simensis, Theropithecus gelada gelada, Theropithecus gelada obscurus, Capra walie, Capra ibex, Capra nubiana , Eurus assinus africanus ,Equus assinus somalensis, Alcelaphus buselaphus swaynei, Tragelaphus baxtoni, Tragelaphus scriptus meneliki, Loxodonta africana knochenhaui* and *Panthera leo abyssincum*. Regarding the conservation status of these animals *Equus assinus africanus* and *Panthera leo abyssincum* are extinct in wild, another two, *Theropithecus gelada gelada* and *Tragelaphus baxtoni* fall in presently least concern, the rest 8 are in endangered category.

The variation in climate, topography and vegetation have contributed to the presence of a large number of endemic species. Ethiopia's high faunal biodiversity reflects the existence of a large number of species of mammals and other higher vertebrates. This in turn reflects a diversity of habitats, created by differing combination of elevation, rainfall and temperature.

Wildlife populations in Ethiopia are under continuous threat, despite the presence of parks and protected areas, over the past several decades, deforestation, farm expansion, drought and illegal hunting were widespread. The forest cover of Ethiopia declined from 47% to only 3% (Timberlake, 1985). Even more important to conservationists, many endemic wild species occur within the country some of which inhabit only very small areas. In Ethiopia, 40 protected areas (National Parks, Animal Sanctuaries and Area Enclosure) cover roughly 16.4% of the country's land area (186,000 km^2). These areas face many challenges due to growing populations, border conflicts, and recurring drought. A chronic and growing issue for Ethiopia's largely pastoral people is local access to grazing lands (Tedla 1995; Ashenafi and Leader-Williams 2005). Given the recurring nature of conflict between conservation and local communities, it is critical that conservationists better understand local views with respect to wildlife and protected areas. It is recommended that community based wildlife conservation is an important solution. However For self sustaining ecosystem benefiting the people around the park although important, the ultimate goal should be to educate them.

Mammals are often the first taxa to be listed for a site .Ethiopia does contain, within the national parks one of the world largest concentration of large mammals (Groombridge 1992). But a complete inventory does not exist and endemism are not well documented. The study of the species richness, endemicity and rarity across geographical areas is essential to select the best places for conserving biodiversity (Kerr, 1997) , besides wildlife are not evenly distributed throughout the country but instead vary in abundance, composition, and these aspects are also not well documented.

Table 10.1 . Biogeography and conservation status of Ethiopian large carnivores

Photo	Species/ subspecies/ Common name	Conservation status/ Distribution Population	Map/ Geographic range
	*Acinonyx jubatu (Smith, 1834): A.j. fearsoni* *Cheetah, Hunting Leop-ard*	Vulnerable Ethiopia Kenya Sudan 2500	
	*Canis adustus (Sandevall, 1847)* *Side striped Jackal*	Least concern Sub Saharan Africa 0.07/Km^2	
	*Canis mesomelas (Schrwber, 1775)* *Black Backed Jackal*	Least concern Sub Saharan Africa 3/km^2	
	*Canis simensis (Ruppell, 1840)* *Ethiopian wolf* *Red fox*	Endangered Bale mountains Semien mountains Guna Tigray endemic to Ethiopia 200	
	*Caracal caracal* *(Schreber 1776)* *Caracal*	Least concern Africa 0.23 /km2	
	*Crocuta crocuta (Erxleben, 1777)* *Spotted Hyena*	Least Concern Africa Abundant	
	*Hyaena hyena (Linnaeus, 1778)* *Striped hyena*	Near threatened	

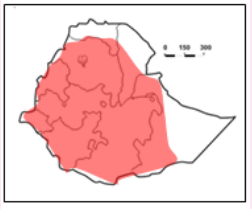
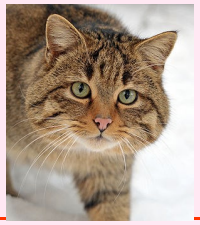
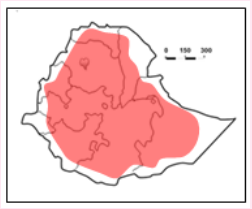
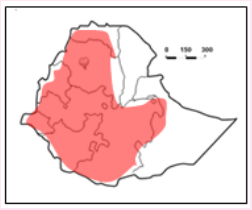
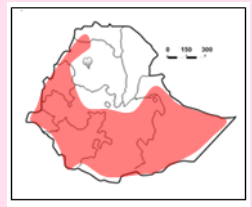
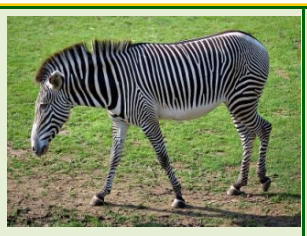
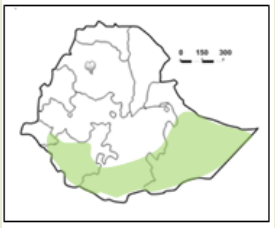
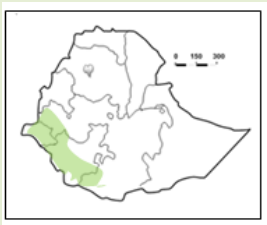
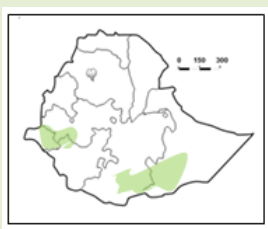
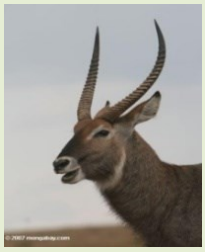
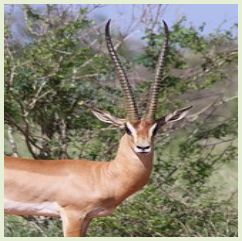
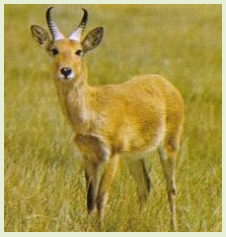
	*Lycaon pictus* *(Temminck, 1820)* *African Wild Dog*	Endangered	
	*Panthera pardus* *(Linnaeus, 1758)* *Leopard*	Near Threatened	
	*Felis silvestris* *(Schreber, 1777)* *Wild cat*	Least Concern	
	*Leptailurus serval* *(Schreber, 1776)* *Serval*	Least Concern	
	*Otocyon megalotis* *(Desmarest, 1822)* *Bat-eared Fox*	Least Concern	
	*Proteles cristata* *(Sparrman, 1783)* *P. c. septentrionalis* *Aardwolf*	Least Concern	
	*Vulpes rueppellii* *(Schinz, 1825)* *Rüppel's Fox*	Least Concern	
	*Panthera leo* *(Linnaeus, 1758)* *Panthera leo abysniccum* *P. l. nubica,* *P. l. roosevelti* *P. l. massaicus* *(Wolff 1961)*	Least Concern *Panthera leo abysinicum* Are extinct	

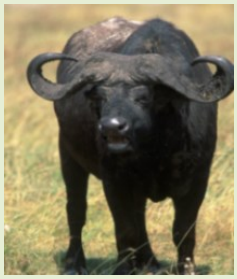
Table 10.2 2. Biogeography and conservation status of Ethiopian large herbivore

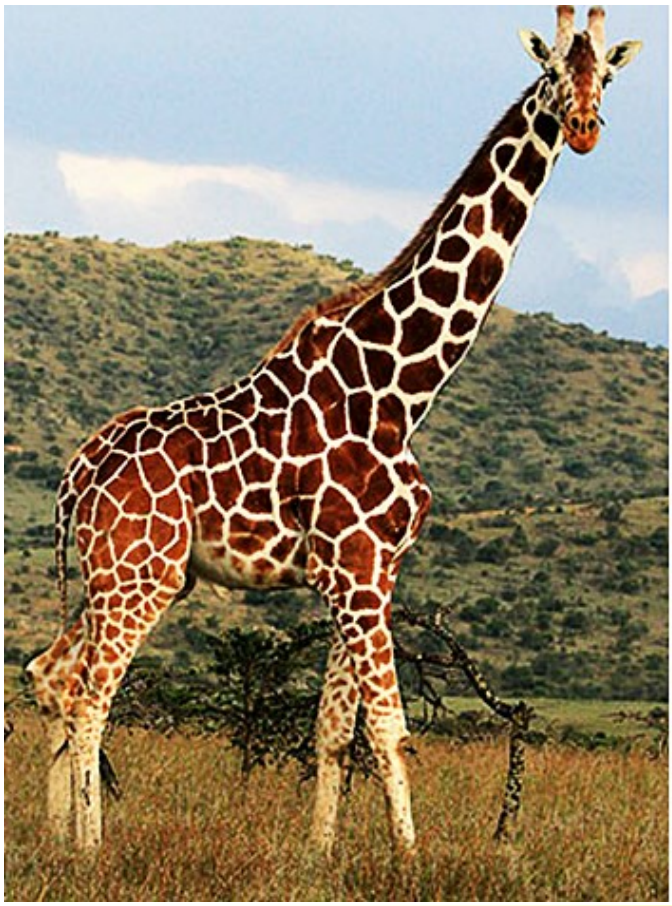
Photo	Species/ subspecies/ Common name	Conservation status/ Distribution Population	Map/ Geographic range
	*Alecephus buselephus (Pallas,1766)* *A.b. swayneus* *Hartebeest, Swayne's Hartebeest*	Least Concern Sub-Saharan Africa Swayne's subspecies are endemic to Ethio-pia 600	
	*Ammodorcas clarkei (Thomas, 1811)* *Clarke'e Gazelle*	Vulenerable Ethiopia and Somalia Endemic to Ogaden 1500	
	*Capra walie* *(Ruppell, 1835)* *C. ibex* *C. nubina* *Walia* *Walie*	Endangered Semien mountains en-demic to Ethiopia 2500	
	*Dorcatragus megalotis (Menges,1894)* *Beira*	Least concern East central and south Africa	
	*Equus assinus africanus (Heuglin and Fizinger 1866)* *African Wild Ass*	Extinct in wild Ethiopia and Sudan	
	*Equus assinus somalicus* *Somali wild ass*	Extinct in the wild Ethiopia, Somalia Eritrea	

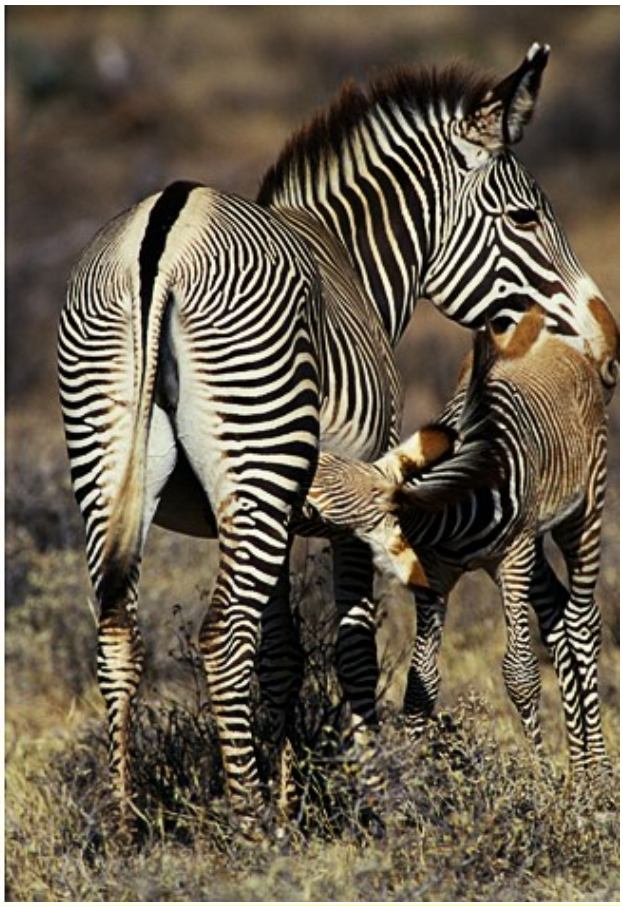
	*Equus grevyi (Oustalet, 1882)* *Grevy's Zebra*	Endangered Ethiopia and Kenya 2200	
	*Eudorcas rufifrons (Gray, 1846)* *Red Fronted Gazelle*	Vulnerable Equatorial Africa 800	
	*Gazella dorcas (Linnaeus, 1758)* *Drocas Gazelle*	Vulnerable North Africa 600	
	*Gazella spekei (Blyth, 1863)* *Speke's Gazelle*	Endangered Endemic to Ogaden Scarce	
	*Hippopotamus amphibius (Linnaeus, 1758)* *Hipopotamus*	Vulnerable Sub-Saharan Africa 2500	
	*Kobus megaceros (Fitzinger, 1855)* *Nile Lechwe*	Near threatened Horn of Africa 0.01/km^2	
	*Litocranius walleri (Brooke, 1879)* *Gerenuk*	Vulnerable Sub-Saharan Africa Common	

	*Loxodonta Africana (Blumenbach, 1779)* *African Elephant*	Vulnerable Sub-Saharan Africa 1000	
	*Madoqua piacentinii (Drake-Brockman, 1911)* *Silver Dik Dik*	Vulnerable Ethiopia and Somalia Abundant	
	*Oryx beisa (Ruppell, 1835)* *Oryx*	Near threatened East Africa 500 0.15/km^2	
	*Tragelaphus buxtoni (Lydekker, 1911)* *Mountain Nyala*	Endangered Bale Ethiopia 2000	
	*Tragelaphus imberbis (Blyth, 1869)* *Lesser Kudu*	Near threatened Easter Africa 10,000	
	*Damaliscus lunatus (Burchell, 1824)* *Tapi*	Least concern Sub-Saharan Africa 3500	
	*Giraffa camelopardalis (Linneaeus, 1758)* *Giraffe*	Least concern Sub-Saharan Africa 2500	

	*Hippotragus equines (E.Geoofray Staint-Hailaire, 1803)* *Roan antelope*	Least concern Central Africa Congo 700	
	*Kobus ellipsiprymnus (Ogilbyi, 1833)* *Water buck*	Least Concern Equatorial and South Easter Africa 0.05/km^2	
	*Kobus kob (Erxleben, 1977)* *kOb*	Least Concern Equatorial Africa 1/km^2	
	*Nanger granti (Brooke, 1872)* *Grant's Gazelle*	Least Concern Ethiopia Somalia Sudan, Kenya 0.6/km^2	
	*Ourebia ourebi (Ziimmerman,1783)* *Oribi*	Least Concern Equatorial and south Africa 2/km^2	
	*Redunca fulvorufula (Afzelius, 1815)* *Mountain Reedbuck*	Least Concern East and south Africa 0.1/km^2	
	*Redunca redunca (Pallas, 1767)* *Bohar Reed Buck*	Least Concern Equatorial, Africa 0.3/km^2	

	*Syncerus caffer (Sparrman, 1799)* *African Bufallo*	Least Concern Equatorial and south Africa abundant	
	*Tragelaphus oryx (Pallas, 1766)* *Common Eland*	Least Concern South Africa 0.86/km^2	
	*Diceros bicornis (Linneaus, 1758)* *D.b. michaeli* *Black Rhino, Rhinoceros*	Endangered Sub-Saharan Africa 400	





Giraffe (Left) and Grevyi Zebra (Right)

DISTRIBUTION:

The larger mammals are mainly concentrated in the south and southwest peripheral border of the country; in fact, out of the 9 national parks, only 2 are not in the dry lands . For this reason they are prone to drought and this makes them prone to migration and extinction. Given the restricted distribution and potential small size of population, these endemic species are most likely to be susceptible to anthropogenic environmental degradation (Baquero and Telleria, 2001).

There are also plentiful games along the stretch of the Great Rift Valley System. Mountain massifs in the north are also home to endemic species of mammals, particularly the *Walia ibex, Canis simensis and Theropithecus gelada.* Hunting has been a major factor in reducing wildlife numbers in the past. Both by local people and European hunters were shooting large number of game animals (for trophy, ivory, skin for trade, protection of crops and livestock). Uncontrolled hunting (poaching) was also a problem. At present many other factors are involved including climate change. This pattern of change mirrors that for the entire continent, where the population of black rhino has shrunken from 60,000 to 4,000 over the last two decades, the elephant population is declining at the rate of 10% per year and many other previously abundant species are now either completely or locally extinct or gravely threatened (Kiss, 1990).

Water supplies by agriculture and stock raising also strongly contribute to the depletion of wildlife numbers (Simonetta and Simonetta, 1983; Cited by Herlocker, 1999).

Many species traditionally viewed as common are also showing dramatic falls in their numbers and habitats have become shrunk like the case of the Mountain Nyala. Declines in common species indicate the widespread deterioration of our environment.

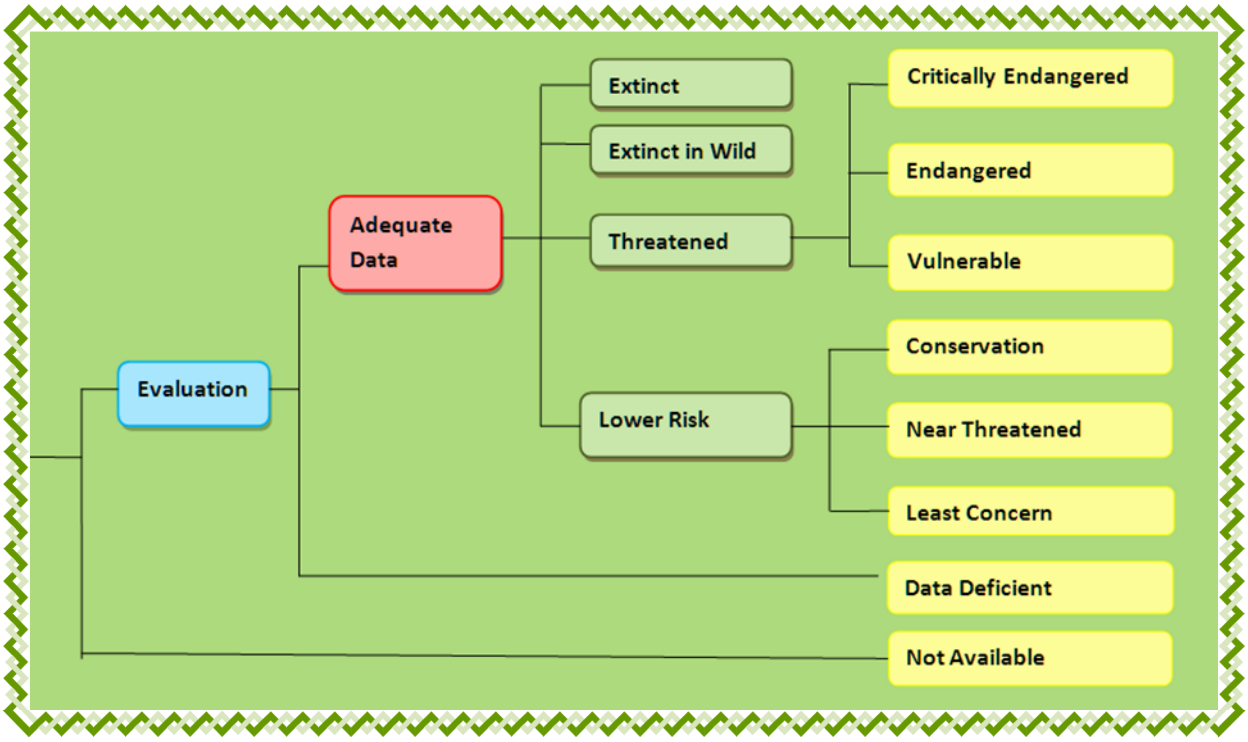


Figure 10.1 Flowchart for determination of conservation status

Table 10.3 Abundance, conservation status and endemism of wildlife in Ethiopia.

#	Taxonomy	Synonym	Habitat/altitude	Population/ Status	Treats
1	*Canis simensis*	Ethiopian Wolf, Simen Jackal	Afroalpine (Bale, Arsi, Semyen (3000-4000m)	400 endangered	Small population, diseases such as rabies, interbreeding with dogs, loss of habitat
2	*Theropithecus gelada gelada Theropithecus. gelada obscurus*	Gelada Baboon, Lion Monkey	Edges and steep slopes or precipices (Simyen, Debresina, Debrelibanos (2800-4600m)	20,000-30,000 Presently Least Concern	Hunted by man for their mane
3	*Capra walie Capra ibex Capra nubiana*	Walia walie	Simyen (2300-4000m)	500 endangered	Hunted for meat, horn and destruction of habitat by local people
4	*Equus assinus somalensis*	African Wild Ass	Desert (Danakil along Awash river in to Ogaden as far as Shebelle river)	200 Critically endangered	Hunted for meat, traditional medicine competition with domestic animals
5	*Equus assinus africanus*	African Wild Ass	North Ethiopia	Extinct in wild (Some in zoo?)	Hunting, loss of habitat
6	*Alcelaphus buselaphus swaynei*	Swayne's Hartebeest	Danakil, Rift valley lakes, Alledeghi, Awash valley	600 Least Concern	Destruction of habitat by human beings
7	*Tragelaphus buxtoni*	Mountain Nyala Dega Agazin	Mountain forest Arsi, Bale (3000-4000)	4000-5000 Endangered	Destruction of habitat
8	*Tragelaphus scriptus menelik*	Menelik's Bushbuck Dukula	Highland forest, Bale and Savanna (Up to 4000m)	Not known due to nocturnal life	Destruction of habitat
9	*Loxodonta africana Knochenhauri*	African Elephant	Mago national park	300 Endangered	Destruction of habitat, by human settlement poaching
10	*Panthera leo abyssincum*	Ethiopian Lion	Previously inhabiting the western part of Ethiopia	Extinct in the wild now are only found in Addis Ababa Zoo	Inbreeding, Disease and mismanagement

***(1) (Sillero-Zubiri and Gottelli 1995); (2) (Allen 1939); (9) (Ansell 1971); (3,4,5) (Yalden 1992); (9)(Enawgachew 2002); (3)(4) (Nowak 1991); (5)(8)(6)(Wolff 1961); (10) (Tefera 2003); (3) (2) (IUCN 2010).**

Plate 10.1 (A) ***Alceluphus buselaphus swaynei,*** **(B)** ***Canis simensis*** **, (C)** ***Loxodonta Africana knochenhaueri,*** **(D)** ***Capra walie*** **(E)** ***Tragelaphus boxtoni*** **and (F)** ***Theropithecus gelada*** **.**

References and Further Reading

GENERAL AND INTRODUCTORY

Albero, M. and Haile-Mariam, S. 1982a. The indigenous cattle of Ethiopia .Part I. World Animal Review, 41:2-10

Albero, M. and Haile-Mariam, S. 1982b. The indigenous cattle of Ethiopia. Part II. World Animal Review, 42:27-34

Buillet, R.W.1975. The camel and the wheel. Harvard University Press, Cambridge.327p

Coppock, D.L. 1994. The Borana plateau of southern Ethiopia: synthesis of pastoral research, development and change, 1980-91. International Livestock Center for Africa, Addis Ababa, Ethiopia.

Epstein, H. 1971. The origin of the domestic animals of Africa. Vol. I. Africana Publishing Corporation, New York, USA.670p

Epstein, H. 1971. The origin of the domestic animals of Africa. Vol. II. Africana Publishing Corporation, New York, USA.670p

FAO.1987. Crossbreeding Bos indicus and Bos Taurus for milk production in the tropics. Animal production and health paper.68: 1-90

FAO. 2000. World watch list for domestic animal diversity. Third edition. Rome. 726p

Faye, B.1997. Guide de l'elevage du dromadaire (Sanofi, La Ballastiete, France).126p

Goe, M. R. 1987. Animal traction on smallholder farms in the Ethiopian highlands. PhD Thesis (Cornell University), UMI Dissertation Information Service, Ann Arbor, Michigan, USA. 408p

Hodges, J.1992.The treat to indigenous breeds in developing countries and options for action. In genetic conservation of domestic animals Vol. II. Lawrence Alderson, L and Bodo I. edition. CAB International, UK.47-55p

Jahnke, H.E. 1992. Livestock Production Systems and Livestock Development in Africa. 32-33.

Mason, I.L. 1996. A world dictionary of livestock breeds, types and varieties. 4th eds. CAB International, UK.273p

Kebede, B. Yemane, B. Animal genetic resource and breed characterization work in Ethiopa .In Rege, J.E.O and Lipner, M.E. (eds). 1992. African Animal genetc resources: their characterization, conservation and utilization. proceedings of the research planning workshop held at ILCA, Addis Ababa, Ethiopia, 19-21 February 1992. Addis Ababa Ethiopia.

Köhler-Rollefson, I.1990. Indigenous practices of Animal genetic resource management and their relevance for the conservation of domestic animal diversity in developing countries. J. Animal Breeding and Genetics, 114:231-238

Maule, J.P. 1990. The cattle of the tropics. Center for Tropical Veterinary Medicine, University of Edinburgh.225p

Payne, W.J.A and Hodges, J .1997. Tropical cattle: origin , breeds and breeding policies. Blackwell Science Ltd, USA.328p

Payne, W.J.A. 1990 . An introduction to animal husbandry in tropics. 4th ed. Long man, UK. 581-603.

Protsch, R. and Berger, R. 1973. Earliest radiocarbon dates for domesticated animals. Science, USA, 179: 235-239.

Svenden, E.D. 1986 . Ed. The Professional Handbook of the Donkey. The Donkey Sanctuary, Sidmouth, Devon.

Rege, J.E.O. 1999. The state of African cattle genetic resource. I Classification frame work and identification of threatened and extinct breeds. Animal Genetic Resource Information, 25:1-25

Rege, J.E.O. and Tawah, C.L. 1999. The state of African cattle genetic resource II. Geographical distribution, characteristics and uses of present day breeds and strains. Animal Genetic Resource Information, 25:1-25

ORIGIN

Anfray, F. 1967. Matara (a pre Axumite sanctuary). Annals d'Ethiopie. Addis Ababa, Ethiopia, 7,33-88

Binns, T. 1995. People and environment in Africa. John wiley and Sons Ltd. USA, 1-3p

Buillet, R.W. 1975.The camel and the wheel. Harvard University Press. Cambridge.

Caroll, C.R. Vandermeer, J.H and Rosset, P.M. 1990. Agroecology. McGrow-Hill Publishing Co. New York. 65p

Chenevière, A. 1989.Ethiopie: berceau de l'humanité. Editions Denoël, Paris, France. 120 p

Edward, U. 1960. The Ethiopians: an introduction to country and people. Oxford University Press.47-57

Encyclopedia Britannica, 1971.

Evans, T.E. 1990. History of Nile flows. In :The proceeding of royal geological society and school of oriental African studies, University of London, 2-3 may 1990, 6-28p

FARM-Africa. 1996. Goat types of Ethiopia and Eritrea. Physical description and management systems. Joint publication of FARM-Africa, London UK and ILRI, Nairobi Kenya, 76p

Joseph, W.M., 1979. Axum. Pennsylvania State University. U.S.A. 1-189p

Pankhurst, R. 2000. Lucy and Ethiopia. Selamta, Camerapix Publishers International, Kenya, 17: 61-64

Payne, W.J.A. 1990. An introduction to animal husbandry in the tropics. 4th ed. Longman. UK.197-210p

Phillipson, D.W.1993. The antiquity of cultivation and herding in Ethiopia. In: The archeology of Africa: Food, metals and towns. T. Shaw, P. Sinclair, B. Andah and Okpoko (eds).London.344-357p

Phillipson, D.W., 1995. Excavation at Axum, Ethiopia, 1993-4. The Antiquaries Journal. 75: 1-41

Spencer, J.E and Thomas W.L. 1978. Introducing cultural geography. John Wiley and Sons, Inc. U.S.A.,428

Tefera, M. 2004. Recent evidence of animal exploitation in the Axumite epoch, 1st-5th century AD. Tropical Animal Health and Production. 6:105-116

CATTLE

FAOSTAT. 2004. Livestock sector brief Ethiopia 2003. Food and Agriculture Organization of the United Nations (FAO). on-line statistical service. Rome: FAO. http://apps.fao.org. Accessed on December 2010.

FAO. 1996. Animal production review. Roma , Italy.

Janhake, EM And Gebrewold, A. 1983. An assessment of the recent past and present livestock situation in Ethiopian highlands reclamation study. Working paper 7. FAO/MOA Addis Ababa Ethiopia.

Cossins, N. 1983.Pastoral systems research in sub-Saharan Africa: proceedings of the IDRC proceedings of the IDRC/ILCA workshop held at ILCA, Addis Ababa, Ethiopia 21 to 24 March, 1983.

DONKEY AND HORSES

Bennett, D. 1998. Conquerors: The Roots of New World Horsemanship. Amigo Publications, Solvang, CA. 422 p.

Bennett, D. and Hoffman, R.S. 1999. Equus Cabalus. Mamalian Species. 628:1-14

Camac, O.R. 2000 Introduction and origins of the donkey. In professional hand book of the donkey. Svendsen edition. White Books Limited, London.9-18

Conacoo, E.A. 1991. Management of Donkey: A southern Ghana experience: In: Donkeys Mules and Horse in tropical agricultural development. Fielding and Pearson. Edition, (.3-6 September 1990). Proceedings of an international colloquium. University of Edinburgh Scotland.189-193P

Conacoo, E.A., Ellis-Sackey G.J and Quashe, B.S. 1991. Management of Donkey: A southern Ghana experience: In: Donkeys Mules and Horse in tropical agricultural development. Fielding and Pearson. Edition. (3-6 September 1990). Proceedings of an international colloquium. University of Edinburgh, Scotland. 98-102p

Dent, A. 1972. The donkey, the story of the ass from east to west. George G .Harrap and Co. Ltd. High Holborn, London. 175p

Fielding, D. 1991. The number and distribution of equine in the world. In: Donkeys, Mules and Horses in tropical agriculture development. Fielding and Pearson edition, (3-6 September 1990.) Proceedings of an international colloquium. University of Edinburgh, Scotland. 62-66p

Gebreab F 1999 Maximizing use of donkey in dryland Ethiopia. In proceeding of National workshop on dryland husbandry 1998, Mekelle University, Ethiopia.119-126p

Grooves, C.P. 2000. Prezewalski horse: morphology, habitat and taxonomy. Australian National University, Canberra, A.C.T. 0200, Australia. http://www.noanswersingenesis.org.au/cg_przewalski_horse.htm

Jones W.E. 1982 Genetics and Horse breeding. 2nd ed. Lea and Fibiger, Philadelphia.202-207p

Millar, C.D and Lambert C.M. 2013.Ancient DNA: Towards a million year old genome. Nature. 499: 34–35. doi:10.1038/nature12263

Pankhurst, R.1989. The early history of Ethiopian horses-names. Paideuma.35:197-206

Squance, M . 2000. Donkey breeds in Europe. In professional hand book of the donkey. Svendsen edition. Whittet Books Limited, London. 138-165p

Weapers, M. 1986 The care and management of farm animals: Donkeys and Mules. W.N. Scuff edition. pp 167-194.

Wilson, T .R . 1990 The donkey . In An introduction to animal husbandry in tropics Payne. W.J.A. eds. 4th ed. Longman, UK. 581-603p

Wilson, R,T. 1991 Equines in Ethiopia. In: Donkeys Mules and Horse in tropical agricultural development. Fielding and Pearson edition, (.3-6 September 1990). Proceedings of an international colloquium. University of Edinburgh, Scotland.33-47.

CAMEL

CSA, Central Statistical Agency. 2009. Report on livestock characteristics Volume II. Statistical Bulletin 468. Addis Ababa, Ethiopia.

Hulsebuch, C.G and Kaufman, B.A (Eds). 2002.camel Breeds and Breeding in Northern Kenya-An account breeding management of Turkona, Bendille, Gabra, and somal: paternalists. Kenya Agricultural Research Institute, Nairobi- Kenya

ILCA, (1992): African animal genetic resources: Their characterization, conservation and utilization. In: proceedings of the research planning workshop held at ILCA, Addis Ababa, Ethiopia. 25-37p

Karue, C.N .1994. The daisy characteristics of the Kenya camel. In: Bonnet, p. (ed) proceedings dromedaries and camels, milking animals, Nookchott, Mauritania.55-56p

Knoess, K.H. (1977): The camel as a meat and milk animal. World animal. ReV. 22:39-44

Tefera M.. and Gebreab, F. 2001. A study on camel productivity and Diseases of camels in Eastern Ethiopia. Tropical Animal Health and production.33 :265-274

Mukasa, E.M, 1981. The camel (Camelus dromedarius): A bibliographical review, (International Livestock Center for Africa, Addis Ababa, Ethiopia). 147p

Scoones, I.1994. Living with uncertainty: new directions in pastoral development in Africa. Intermediate Technology Publication, UK.

Wilson, R.T. (1998): camels: the Tropical Agriculturalist. Mecmillion education Ltd. 47-68p

SHEEP AND GOAT

Ørskov, ER. 1988. The varying roles of domestic livestock in Africa and their problems. In: Exploitation of Animals in Africa, Aberdeen University African Studies Group. 76p

Devendra, C. and Burns, M, 1983. Goat production in the Tropics. Second Edition. Commonwealth Agricultural Bureau. Farnham Royal, Slough SL 3BN, UK.183p

Devendra, C. and McLeroy, G.B., 1988.Goat and Sheep Production in the Tropics. Longman, Singapore.

Farm-Africa. 1996. Goat types of Ethiopia and Eritrea. Physical description and management systems. Published jointly by FARM-Africa, London, UK, and ILRI (International Livestock Research Institute), Nairobi, Kenya

Gatenby, R.M. 1991. Sheep. Macmillan Education Ltd, Uk. 154p

Gizaw, S. 2008. Sheep resources of Ethiopia: Genetic diversity and breeding strategy. PhD thesis,Wageningen University, Netherlands

Gizaw, S., van Arendonk, J.A.M., Komen, H., Windig, J.J. and Hanotte, O. 2007. Population structure, genetic variation and morphological diversity in indigenous sheep of Ethiopia. Animal Genetics 38:621–628.

Peacock C. 1996. Improving goat production in the tropics. A Manual for Development workers. Published jointly by FARM-Africa and Oxfam (UK and Ireland), Oxfam, UK. 87p

DOG AND CAT

Adamelli, S., Marinelli, L., Normando, S. & Bono, G. 2005. Owner and cat features influence the quality of life of the cat', Applied Animal Behavior Science. 94: 89 –98.

Arizona human society.2007. Dog breed characteristics. Rev. AHS. , www.azhumane.org ©2006 Arizona Humane Society.

Blackshaw, J. 1996. 'Developments in the study of human-animal relationships', Applied Animal Behavior Science 47:1–6

Elaine A. Ostrander and Robert K. Wayne. 2005. The canine genome. Genome Res. 15: 1706-1716. doi:10.1101/gr.3736605

Encyclopædia Britannica Online. 2011. s. v. "pet,". Accessed December 25, 2011, http://www.britannica.com/EBchecked/topic/453505/pet.

Lindbald-Toh, K. 2005. 'Genome sequence, comparative analysis and halotype structure of the domestic dogs', Nature 438(7069): 803–819.

Morey, D. 2006. 'Burying key evidence: The social bond between dogs and people', Journal of Archaeological Science 33, 158–175.

Savolainen, P., Zang, Y., Luo, J., Lundeberg, J. & Leitner, T. 2002. 'Genetic evidence for an East Asian origin of domestic dogs', Science 298(5598): 1610–1613.

Washington S tat e U n i v e r s i t y. 2008. Extension.4-H Cat Project Youth development program

WILDLIFE

Abunie, L. 1991. Range use in Ethiopia: A case study of wildlife/livestock interfaces in Yabello wildlife sanctuary and adjacent areas, Borana region, Norway. MSc. Thesis, Agricultural University of Norway, Oslo.

Allen, C.M. 1939. A checklist of African Mammals. Cambridge.

Ansell, W.F.H. 1971. Order proboscidae, family Elephantidae in the mammal species of Africa: an identification guide part II. In Meeter, J and Setzer, H.W. (ed) Smithsonian institute press, Washington.

Ashenafi, Z.T., Coulson, T., Sillero-Zubiri, C,. Leader, W N. 2005. Behaviour and ecology of the Ethiopian wolf (Canis simensis) in a human-dominated landscape outside protected areas. Anim Conserv 8:113–12

Baquero, R and. Telleria, J . 2001. Species richness, rarity and endemicity of European mammals: a biogeographical approach. Biodiversity and Conservation 10: 29–44.

Berger, D.J. 1993. wildlife extension participatory conservation by the maasai of Kenya. ACTS press, Nairobi.

Conway, W. 1995. Wild and zoo animal interactive management and habitat conservation. Biodiversity and Conservation 4,573-594

Enawgachew, C. 2002. overview on the status of the African Elephant (Loxodota africana) in the Omo and Mago national parks. 12th annual conference of Biological Society of Ethiopia, Faculty of Science, Addis Ababa University. Abstract

Groombridge, B. 1992. Global biodiversity: status of the earth's living resources. Chapman and Hall, London

Herlocker, D. 1999. Rangeland resources in eastern Africa: their ecology and development. GTZ, German Technical Cooperation, Nairobi, Kenya

IUCN. 2010 a. IUCN Red List of Threatened Species. Version 2010.4. <www.iucnredlist.org>. Downloaded on 28 November 2010.

IUCN. 2010 b. Standards and Petitions Subcommittee. 2010. Guidelines for Using the IUCN Red List Categories and Criteria. Version 8.1. Prepared by the Standards and Petitions Subcommittee in March 2010. Downloadable from http://intranet.iucn.org/webfiles/doc/SSC/RedList/RedListGuidelines.pdf.28. November 2010

Kerr, J.T. 1997. Species richness, endemism, and the choice of areas for conservation. Conservation Biology 11: 1094–1100

Kiss, A. 1990. Living with wild life: resource management with local participation in Africa. Technical Paper series. World Bank, USA

Morgan, W.T.W. 1973. East Africa. Longman, London

Myers, N. 1972. national parks in savanna Africa. Science.78: 1255-1263

Nowak, R. 1991. Walker's mammals of the world. 5th ed.Vol.1. John Hopkins University Press, London.

Said, A. 1997. Resource use conflict in the middle Awash valley of Ethiopia: The crisis of Afar Pastoralism. In: pastoralist, ethnicity and state in Ethiopia. Richard Hogg (Edn). Haan Publishing. London.

Sillero-Zubiri, C. and Gottelli, D. 1995. Spatial organization in Ethiopian wolf Canis simensis: large packs and small stable home ranges. Journal of Zoology, London. 237:65-81

Tedla, S. 1995. Protected areas management crises in Ethiopia. Journal of the Ethiopian. Wildlife and Natural History Society 16.

Tefera, M. 2003. phenotypic and reproductive characteristics of lions (Panthera leo) at Addis Ababa zoo. Journal of biodiversity and conservation. 12: 1629–1639

Timberlake, L. 1985. Africa in Crisis: the causes and the cures of environmental bankruptcy. Tinker J (ed.) Earth scan London ,UK 1985 , 232p

UNEP. 1993. Global biodiversity. Nairobi, Kenya

Wolff, J.V. 1961. Wildlife in Ethiopia. Ethiopian Forestry Review. 2: 3-13

Yalden, D. and Largen ,M.J. 1992. Endemic Mammals of Ethiopia. Mammal Review. 22:115-125

Last on Earth : Somali Wild Ass (Critically Endangerd)

Tefera, M. 2003. Phenotypic and Reproductive characteristics of lions (*Panthera leo*) at the Addis Ababa zoo. *Journal of Biodiversity and Conservation*. 12:1629-1639. (Last seen 1995)

ISBN 978-99944-981-3-0